DOCUMENT RESUME

ED 457 847 IR 021 000

AUTHOR	Atkinson, Thomas R., Jr.
TITLE	Toward an Understanding of Instructor-Student Interactions: A Study of Videoconferencing in the Postsecondary Distance Learning Classroom.
PUB DATE	1999-00-00
NOTE	288p.; Doctoral Dissertation, Louisiana State University.
PUB TYPE	Dissertations/Theses - Doctoral Dissertations (041)
EDRS PRICE	MF01/PC12 Plus Postage.
DESCRIPTORS	Computer Assisted Instruction; Computer Interfaces; *Computer Mediated Communication; *Distance Education; Higher Education; *Interaction; Interaction Process Analysis; Peer Relationship; Student Attitudes; *Teacher Student Relationship; Telecommunications
IDENTIFIERS	*Video Teleconferencing

ABSTRACT

This qualitative case study examined interactions, effect of instructional strategies on interactions, participant attitudes, and perceptions that occurred during two courses taught via interactive videoconferencing in higher education. Analysis of coded observational data, field notes, and interviews with students and instructors provided insights about the distance learning environment. Using an interaction model, the classroom interactions were grouped into the following categories: learner-content, learner-instructor, learner-learner, and learner-interface. Results showed that learner-instructor and learner-learner interactions were highest during classes that were organized as discussion sessions with specific guidelines for the content and the nature of questions on which the dialog would focus. Several instructor strategies appeared to increase interactions with the students at the remote site. Statements of praise and acceptance of student ideas and the use of questions that required the learners to synthesize and draw conclusions rather than simply recall information were effective in soliciting responses. Humanizing the students' learning experiences by using their names and relevant personal experiences increased participation. Use of visual realia and well-designed textual visuals provided a scaffold for connecting the students with course content and facilitated dialog. A strategy that proved to be minimal in effectiveness was the use of peer presentations. During these presentations, fewer interactions occurred and more of-task behaviors were observed. A major detriment of effectiveness in the distance learning classroom is the expertise of the instructor to present content information and elicit student participation. Learner-instructor interactions were impaired by limitations of the technology. Students at the remote site reported feelings of isolation when excluded from informal conversations at the local site. Both instructors and students indicated that the technology created a barrier to spontaneity and the ability to read facial expressions and other physical cues. A mediator located at one remote site helped reduce transactional distance by manipulating the cameras and helping learners to interface with the technology. This assistance allowed the instructor to focus more attention on teaching and engaging students with content information. Additionally, the mediator facilitated student participation through modeling and encouragement. (Contains 117 references.) (Author/AEF)

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ED 457 847

TOWARD AN UNDERSTANDING OF INSTRUCTOR-STUDENT INTERACTIONS: A STUDY OF VIDEOCONFERENCING IN THE POSTSECONDARY DISTANCE LEARNING CLASSROOM

A Dissertation

Submitted to the Graduate Faculty of the
Louisiana State University and
Agricultural and Mechanical College
in partial fulfillment of the
requirements for the degree of
Doctor of Philosophy

in

The Department of
Educational Leadership, Research, and Counseling

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Acknowledgements

The researcher would like to acknowledge the time and efforts contributed by the following committee members: Dr. Charles Teddlie, Dr. Richard Fossey, Dr. Eugene Kennedy, Dr. Donald Kraft, and Dr. Dana Watson, and to extend gratitude and appreciation to two very special individuals, whose patience and support made it possible: Dr. Susan Kim MacGregor (committee chair) and Dr. Rhonda Atkinson (editor and loving wife). Appreciation is also given to Rachel Atkinson (daughter) for her patience and to Katie (cat) for companionship throughout the process.

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Abstract

This qualitative case study examined interactions, the effect of instructional strategies on interactions, participant attitudes, and perceptions that occurred during two courses taught via interactive videoconferencing in higher education. Analysis of coded observational data, field notes, and interviews with students and instructors provided insights about the distance learning environment. Using an interaction model, the classroom interactions were grouped into the following categories: (a) learner-content, (b) learner-instructor, (c) learner-learner, and (d) learner-interface. Results showed that learner-instructor and learner-learner interactions were highest during classes which were organized as discussion sessions with specific guidelines for the content and the nature of questions on which the dialog would focus. Several instructor strategies appeared to increase interactions with the students at the remote site. Statements of praise and acceptance of student ideas and the use of questions that required the learners to synthesize and draw conclusions rather than simply recall information were effective in soliciting responses. Humanizing the

students' learning experiences by using their names and relevant personal experiences increased participation. Use of visual realia and well-designed textual visuals provided a scaffold for connecting the students with course content and facilitated dialog. A strategy that proved to be minimal in effectiveness was the use of peer presentations. During these presentations, fewer interactions occurred and more off-task behaviors were observed. A major determinant of effectiveness in the distance learning classroom is the expertise of the instructor to present content information and elicit student participation. Learner-instructor interactions were impaired by limitations of the technology. Students at the remote site reported feelings of isolation when excluded from informal conversations at the local site. Both instructors and students indicated that the technology created a barrier to spontaneity and the ability to read facial expressions and other physical cues. A mediator located at one remote site helped reduce transactional distance by manipulating the cameras and helping learners to interface with the technology. This assistance allowed the instructor to focus more attention on teaching and engaging students with content information. Additionally, the mediator facilitated student participation through modeling and encouragement.

Chapter 1

Introduction

This study is divided into five chapters beginning with an introduction, followed by a review of literature, description of the methodology, reporting of the results, and summary. The first chapter defines the rationale and purpose of the study. In the context of a qualitative approach, research questions are provided as a guide to describe the nature of the study. The introduction concludes with a rationale for the methodology and a description of the method for reporting the results.

Research indicates that instructional medium (e.g., interactive video, videotape, face-to-face) has little effect on student achievement as long as the delivery technology is appropriate to the content being offered and all participants have access to the same technology (Moore & Kearsley, 1996). Other conclusions suggest that achievement on various tests administered by course instructors tends to be higher for distant as opposed to traditional students (Souder, 1993), yet no significant difference in positive attitudes toward course material is apparent between distant and traditional education

(Martin & Rainey, 1993). Conventional instruction is often perceived to be better organized and more clearly presented than distance education (Egan et al., 1991), and yet, instructors often comment that the organization and reflection needed to effectively teach at a distance often improves their traditional teaching.

Most educators agree that technologies such as interactive videoconferencing create a different learning environment to which both the instructor and the students must adapt. Lack of mobility, face-to-face contact, and sound activation delays create a "transactional distance" that embodies both physical and psychological effects that must be overcome by the instructor and students (Moore & Kearsley, 1996, p.200). To what degree they adapt may affect the success of learning. Many colleges and universities have deployed interactive distance learning systems to extend their academic programs beyond the long established physical boundaries of their institution. Salomon (1974) believes that the medium used to transmit information carries with it a means of interaction that is peculiar to the medium and that colors the content. To be able to extract the intended meaning, the learner must be literate in the medium's rules of interaction. The extent to which a learner is proficient with a specific medium correlates positively with the success the learner has in extracting the desired information. Learners need to understand and possess the necessary skills before they can successfully interact with the content, instructor, or other learners (Hillman, Willis, & Gunawardena, 1994).

In the fall of 1995, the university installed a point-to-point, two-way, interactive videoconferencing system to link the campuses across the state. In the Spring Semester of 1996, six courses were offered; two of which are the focuses of this study. The research of this study examines interactive videoconferencing technology that uses telephone lines to connect two separate classrooms via two-way audio and video communications between the participants. The teaching style of the instructor, class preparations, use of organizers, implementation strategies, type of evaluation, classroom management styles, and the use of a facilitator or mediator strategies were examined.

For collecting classroom observational data, Flanders's Interaction Analysis (Flanders, 1970) was adapted to accommodate the use of videoconferencing technology. This data collection protocol was one of the procedures widely used during the 1960s for studying the verbal interactions between the instructor and students in the classroom. Using pre-determined protocols, an observer identifies and records the nature of each interaction as it occurs between the instructor and students and between the students during class. This protocol was selected because of its sensitivity to pedagogical styles rather than to curricular content (Stake, 1995).

To observe specific characteristics of the technology, categories were added for camera changes, equipment malfunctions, and general observations related to the technology. The observer recorded codes in real-time by data entry into a computer using a software program, called Observation Protocol Software (OPS), designed and developed by the researcher.

Following the observations, Spradley's Descriptive Question Matrix (1980) provided a structure for informant interview questions that included aspects of space, objects, acts, activities, events, time, actors, goals, and feelings related to the perceptions of the participants. The pre-constructed questions provided a starting point for inquiry. Descriptive questions varied depending on responses during the interviews.

Rationale

While most research indicates that interactive distance learning is as effective as traditional classroom instruction, there is limited research describing its effective use (Schlosser & Anderson, 1994). Students seem to learn equally well from lessons delivered with any medium, face-to-face or at a distance. Hundreds of media comparisons indicate, unequivocally, that there is no inherent significant difference in the educational effectiveness of media. Several researchers indicate that further comparisons of the effectiveness are not needed (Clark, 1983). Evidence suggests that the specific medium does not matter. Students learning at a distance have the potential to learn just as much and as well as students taught traditionally (Schlosser & Anderson).

Findings of many studies attest to the effectiveness of distance learning technology. The results of a study of secondary science students enrolled in an academic honors program indicate that neither student achievement nor attitude was adversely affected by distance delivery (Martin & Rainey, 1993). In a study of attitudes and perceptions of students and instructors, participants at the distance classroom had a significantly more positive attitude than students at the origination site. There was no significant difference in the average grades earned by the students at the two sites (Jurasek, 1993). Some students found that the medium actually enhanced its content, proving to be a value-added experience (Abbott, Dallat, & Robinson, 1995).

Although research indicates that mediated instruction at a distance is equivalent to traditional classroom experience, more studies are needed to describe those properties that are clearly different. Research must address the mix of student characteristics, teacher competencies, and technology competencies (Hedberg & McNamara, 1991).

Many questions concerning future research in interactive distance learning still remain. What kinds of interactions occur in distance learning? Who participates, when and how? Does the interaction move from instructor to student, student to instructor, or does it include extensive interaction between students, both in the same physical location and over distance? What is the instructor's role? How is information presented? How are materials used? Are instructors modifying their teaching approaches and developing new strategies due to the technology? How do instructors prepare for distance learning teaching? What are students' perceptions and attitudes about learning through interactive videoconferencing?

The successful use of distance learning technology may require modifications in customary instructional strategies and a clearer understanding of the process (Bruce and Shade, 1995). Before schools invest their resources and time, research must provide better insight into the process to maximize the effectiveness of a most promising technology and to better understand the dynamic relationships and interactions that occur with its use.

Purpose

The purpose of this research was to study the nature of learning and instruction as it occurred in higher education classes where interactive videoconferencing was used in the instructional delivery. The primary role of the researcher in this study was that of an observer, interviewer, interpreter, and evaluator. No attempt was made by the researcher to influence or become involved in the learning process.

Research Questions

This research studied the nature of learning and instruction as it occurs in higher education classes where interactive videoconferencing was used in the instructional delivery. The study was guided by the following questions:

1. What was the nature of the interactions that occurred between instructor and students at and between the delivery and a remote site?

2. How were the interactions affected by the instructional strategies used?

3. What were the attitudes and perceptions in distance learning when using interactive videoconferencing?

Rationale for Qualitative Case Study Approach

While it is appropriate to study the effectiveness of interactive videoconferencing in distance learning by analyzing test scores, a quantitative only analysis may not provide sufficient insight into improving and understanding the process. To understand and interpret the complex interrelationships and interactions between the various components of this process, a qualitative case study approach was employed.

A qualitative case study design provides narrative descriptions and explanations of phenomena investigated, with lesser emphasis given to numerical quantifications. Methods used to collect qualitative data include ethnographic techniques such as observing and interviewing. Qualitative studies involve research questions typically oriented to cases or phenomena, seeking patterns of unanticipated, as well as, expected relationships. The variables are often experiential rather than operationally defined (Stake, 1995).

This study, while primarily qualitative in nature, contains quantitative details of coded observations and interviews. Therefore, it may be categorized as a mixed method study that provides textual descriptions to further understand the process with limited numerical analysis of the observations.

Further, because of the availability and expense of the technology, only a small population sampling was used. Prior quantitative research implies that similar techniques in using technology for learning are comparable in their effectiveness. A better understanding of how instructors organize learning is needed in this context and how various instructional approaches influence learning and understanding of the course content. Also, a case study is preferred when the relevant behavior cannot be manipulated (Yin, 1989).

Reporting

For the purpose of reporting the findings of this case study, the following organizational approach, as outlined by Stake (1995) was implemented. An overview begins, followed by an issue identification, purpose, and method of the study. A review of literature provides narrative to further define the case and contents, and provide perspective and development of the issues for understanding the complexity of the case.

Descriptive details, documents, quotations and triangulating data are provided as prescribed by the research questions. Following assertions to allow readers to form their own generalizations, a summary describes the researcher's understandings and level of confidence.

Definition of Terms

Camera lag - when the camera view does not follow the activities during a presentation.

Communication protocols - techniques used to increase learner-interface interactions (Hillman, Willis, & Gunawardena, 1994).

Constructivist teaching - seek out and use student questions and ideas in designing lessons, promote student leadership and collaboration, use open-ended questions, encourage students to predict outcomes, test their ideas, develop cooperative learning strategies, provide time to reflect and analyze ideas, and to respect others' ideas (Yager, Dunkhase, Tillotson, & Glass, 1995, p.20).

Dialog and structure - dialog focuses on the interplay of words, actions, and ideas that occur as interactions between the teacher and learner when one gives instruction and the other responds; structure refers to elements in the course's design, which include teaching style and instructional strategies (Moore & Kearsley, 1996, p.201-202).

Didactic teaching - teaching with guided conversation or dialog between the teacher and student as opposed to a one-way lecture method (Moore & Kearsley, 1996, p. 202).

Discourse analysis - a technique for coding speech acts based on specific categories or phenomena for understanding the coherence and sequential organization of natural conversation (Saba & Shearer, 1994, p.40).

Distance learning - formal, institutionally-based educational activities where the teacher and learner are normally separated from each other in location but not normally separated in time, and where two-way interactive telecommunication systems are used for sharing video, data, and voice instruction (Simonson & Schlosser, 1995, p.13).

Facilitator - in the context of this study, personnel that provides technical support and helps manage a site by directing the learners' attention, switching cameras and monitoring the process.

Humanizing - creating an acceptable environment to break down the feelings of separation between the instructor and students by technology (Moore & Kearsley, 1996, p.136-137).

Interactive videoconferencing - two-way audio and video communications often using compressed video from point-to-point across telephone lines.

Instructional interaction - interactions that occur between the learner, instructor, content, and technology interface in an educational setting (Moore & Kearsley, 1996, p.128).

Learner autonomy - the potential of distant learners to participate in the determination of their learning objectives, the implementation of their programs of study, and the evaluation of their learning (Moore & Kearsley, 1996, p.204).

Local and remote sites - in the context of this study, local site refers to the primary location of the instructors and the remote site refers to the distant location where students attend class.

Mediator - in the context of this study a curriculum expert who can provide content support by answering questions to consolidate the learners' understanding and manages activities at the remote site on behalf of the instructor; sometimes referred to as a moderator.

Message style - presentation techniques to enhance interest and appeal, such as, the use of short instructional segments, varying tone of voice and volume, and supplementing programs with visual aids (Moore & Kearsley, 1996, p.136-137).

Multiple realities - differing views of the events that occur when studying complex situations and essential to the qualitative approach for case studies (Stake, 1995, p.12).

NUD.IST - Non-numerical Unstructured Data Indexing Searching and Theorizing is a computer software designed to aid users in handling non-numerical and unstructured data in qualitative analysis.

Participation - the extent of interaction among participants in the interactive situation (Moore & Kearsley, 1996, p.137).

Protocol - in the context of this study, the categorization of a concept that is assigned a code for tracking a specific behavior when observing participants in a study.

Text-units - in the context of the NUD.IST software, a method of grouping segments of text for analyzing similarities and differences.

Transactional distance - a function of the variance in dialog and structure as they relate to each other (Moore & Kearsley, 1996, p.203).

Triangulation - a method used in qualitative studies to corroborate information by collecting data from different sources to support a central theme or concept (Stake, 1995, p.107).

Limitations of Study

The primary research of this study was limited to observations followed by interviews of the participants. Although some generalization in a qualitative study is possible, broad generalizations are usually limited. Any generalization of this study is restricted to higher education classes using a point-to-point, two-way, interactive videoconferencing system. The main campus was designated as the local site where the instructors taught and the distant campus was the remote site. At the time of the study, there were only six courses offered via the interactive videoconferencing sites. In an effort to select courses with students at a comparable level and instructors with contrasting instructional style, this study was limited to the students enrolled in only two courses which were contrasting in content, the technology experience level of the instructors, and the instructional strategies they used. The collection of observational and interview data were performed by only the researcher, thereby limiting analysis to the perceptions of one viewer.

The number of observations were limited to nine for Case A and four for Case B at intervals during the beginning, middle, and end of the semester. Additional observations were planned but sudden cancellation of the classes due to weather, equipment failures, and rescheduling of examinations prevented them. These problems and inconsistencies further limited the direct comparison of the cases and between observations within each case. Interviews, which occurred following classes and by telephone, were limited to availability of the participants. The student interviews by telephone were restricted to approximately 10 minutes and in person to 30 minutes. The instructor interviews were restricted to two 30-minute sessions for each case.

During collection of the data, the researcher was unable to record events that occurred simultaneously or in less than five second intervals due to the processing time of each event as they were entered into the computer. Recording of field notes were limited to the typing ability (approximately 40 words per minute) of the researcher.

Chapter 2

Review of Literature

This chapter begins with definitions of distance education followed by a brief history and description of current technologies. Theories of instructional interaction are presented with specific strategies for improving interactions in an interactive distance learning environment. The last section describes research in distance education specific to interactive technology and learner attitudes, perceptions, and characteristics.

Introduction

For over 100 years, students have participated in learning at a distance in which self-paced study guides and paper-based assignments remained the primary mode of instruction (Gough, 1980; Johnson & Amundsen, 1985). The meaning of distance education, or learning, often varies depending on the context in which it is used. It has been used to describe traditional correspondence study programs, as well as the latest programs in satellite, computer, or two-way video instruction in synchronous and asynchronous formats. Although the format may vary, several conceptual attributes remain consistent and contribute to the constancy of traditional distance education.

Definitions of Distance Education

Coldeway, MacRury, and Spencer (1980), of Canada's Athabasca University, suggest that different combinations of the conceptual attributes of time and place define various forms of education. Traditional instruction occurs at the same time and place. Individual learning takes place at different times but in the same place. Coldeway's et. al. instructional attributes form a continuum that reflects the essence of earlier definitions and characterizations of the distance education concept.

Distance learning can be described as the separation of teacher and student in time and space (Holmberg, 1986). Perraton (1988, p.34) defined distance education as "an educational process in which a significant proportion of the teaching is conducted by someone removed in space and or time from the learner." This definition helps establish the parameters of distance learning. However, recent advances in instructional technology and understanding student needs in distance learning settings require an elaboration of the definition.

More recent definitions (Lauzon & Moore, 1989; Barker, Frisbie, & Patrick, 1989) emphasize the technology and the level of interactions that occur. Distance learning can be divided into correspondence-based or telecommunications-based, according to the levels of instructor-student and student-student interaction, recognizing that newer technologies minimize the separation of instructors and students in time, if not in space (Moore & Kearsley, 1996).

In distance education, instruction can take place at different locations at the same time or at both different times and different locations. Garrison (1989) defined distance learning as educational communication between instructor and participants when separated by a geographical distance. In most distance learning environments, communication is two-way and often employs technology to facilitate the learning process. The latest technologies associated with distance learning are interactive videoconferencing, audio conferencing, and computer conferencing. Garrison (1989) characterized distance education as instruction which implied that the majority of educational communication between instructor and student occurred non-contiguously yet involved two-way communication between and among students and instructor, and used technology to mediate and facilitate the necessary two-way communication.

The U.S. Department of Educational Research and Improvement (in Bruder, 1989, p.30) defined distance education as "the application of telecommunications and electronic devices which enable students and learner to receive instruction that originated from some distant location." Rumble (1989, p.19) placed emphasis on the relationship of the learner, instructor, and institution by describing distance education as a "method of education in which the learner is physically separate from the teacher. It may be used on its own, or in conjunction with other forms of education including face-to-face. The learners are physically separated from the institution that sponsors the instruction."

Recent definitions reflect the effects of rapid changes in society and technological developments; however, they retain aspects of Coldeway's et al. (1980) conceptual attributes of distance education as instruction that occurs in different times and places. Live two-way video and audio essentially allow instruction to occur at the same time and place in two different places. Similarly, Simonson & Schlosser, (1995, p.13) define distance education as "formal, institutionally-based educational activities where the teacher and learner are normally separated from each other in location but not normally separated in time, and where two-way interactive telecommunication systems are used for sharing video, data, and voice instruction."

These new definitions that suggest the concept of distance education as being different from education is changing. The future focus will be simply on education in whatever format it exists. Growing interest in using technology to deliver instruction has warranted the need for research of distance learning technologies (Gee, 1990).

History of Distance Education

The first form of distance education was correspondence study through the medium of the Post in the early 1800's. Correspondence Colleges became popular in both England and Germany, but it was not until 1873 that correspondence study was offered in the United States by the Society to Encourage Studies at Home. Within ten years, academic degrees were authorized by the State of New York through the Chautauqua College of the Liberal Arts for correspondence work and at a number of other American colleges including the University of Chicago, the University of Wisconsin, and Illinois Wesleyan. In 1891, the practicality of such courses was seized upon by Thomas J. Foster who began offering correspondence study on the subject of mining and the prevention of mining accidents. The explosion of interest led to the development of the International Correspondence School which served more that two million students by 1920 (Holmberg, 1986).

Because private correspondence schools had experienced great success with traditional correspondence formats, they were among the first to use electronic formats (Holmberg, 1986). Although colleges and universities participated in experimental teaching programs as early as the 1930s, college credit courses were not offered via broadcast television until two decades later (Buckland & Dye, 1991). Satellite technology, although developed in the 1960s, was not cost-effective for distance education programs until the 1970s and 1980s. Federally funded experiments such as the Appalachian Education Satellite Project in the mid-70s demonstrated the feasibility of satellite delivery. In the 1980s and early 1990s the trend in distance education applied fiber optic communication systems for the delivery of instruction via two-way, high quality, audio and video systems (Tompkins, 1993). The latest technology, computer-mediated communication, facilitates the kind of student interaction and collaboration not possible with earlier forms of distance education (Riel & Harasim, 1994). Computer interfaces and the World Wide Web enable colleges and universities to offer online courses, and in some cases, degrees (Lintz & Tognotti, 1996).

Current Status of Distance Education

Many of the older forms of distance education, including postal mail correspondence, videotape, and audio-cassette are being converted into electronic mail, online computer access, telephone faxes, and interactive conferencing systems to create two-way communication channels (Thach & Murphy, 1995). Many traditional lecture courses are being transformed and enhanced by new technologies. Effective partnerships among educators, business and industry, government, and communities have developed links to rural areas for distance learning and communications.

The new technologies allow two-way interaction of audio, video, and computer graphics between multiple locations through telephone lines. At Stanford University, Friedlander and Kerns (1998) developed a learning lab that hosted a web site for students attending large lectures to interact. It provided more faculty-student interaction through cross-sectional projects and panels that led students to feel a greater sense of community. Web-based assignments guided the students and gave them the freedom to explore their own ideas within a framework that provided a rigorous introduction to methods and works.

In an ideal instructional situation, the storage, transmission and presentation mechanisms become somewhat irrelevant to the instruction and to the learning. However, it is not common practice in education yet. This may be due to the rapid advances in the technology and that much of its application continues to be technologically driven rather than instructionally driven (Hedberg & McNamara, 1991).

Theory of Instructional Interaction

The importance of interaction in education is practically a given. Shale and Garrison (1990) describe education in its most fundamental form as an interaction among teacher, student, and subject content. Sewart (1982) proposed an interaction continuum where all educational transactions occur with learner-instructor at one end and learner-content interaction at the other. Keegan (1990) believes that interaction is the key to effective learning and information exchange. For example, learners value timely feedback concerning course assignments, examinations, and projects (Egan et al., 1991). This helps them gauge their progress and make meaningful changes in performance. Studies show that a learner's avoidance of learner-instructor interaction leads to poor academic achievement (Booher & Seiler, 1982). The value of interaction is not limited to traditional classroom instruction. Moore and Thompson (1990) identify interaction as a major component in promoting positive learner attitudes toward distance learning. Thus, learners appear to be more motivated if they are in frequent contact with the instructor. More structured contact might be utilized as a motivational tool (Coldeway et al., 1980).

A study by Hillocks (1981) on interactions indicated that during classroom discussions, 50% of the students did not interact during the course. During lecture, 70% of the students did not interact. Results of another study on credit courses in a traditional classroom show that student interactions constituted only about five percent of the instructional time (Lewis & Woodward, 1984). These studies indicate that interaction by individual students was a small part of the instruction despite the fact that both students and teachers seem to value interaction during the instruction. Studies support the importance of techniques that allow students to interact with students at other sites and with the instructor. The degree of interaction seems to be highly related to student satisfaction (Price & Repman, 1995).

Kinds of Interactions. Moore (1989), identified three kinds of instructional interactions: (a) Learner-content, (b) Learner-instructor, and (c) Learner-learner. Learner-content is the process of intellectually interacting with content to bring about changes in the learner's understanding, perspective, or cognitive structures. Learner-instructor interaction attempts to motivate and stimulate the learner and allows for clarification of and misunderstanding by the learner with the content. Learner-learner interaction occurs between one learner and another learner, alone or in group settings, with or without the real-time presence of an instructor. Instruction in higher education overwhelmingly consists of lecture that is learner with instructor interaction. Moore (1989) advocates the use of learner-with-learner interaction during televised, interactive instruction. Lecture information could be substituted with alternatives such as books and instructional materials. Valuable televised time should be reserved for other types of interactions.

Although each of these three types of interaction addresses the use of technologies as bridges for interaction, they fail to take into account the interaction that occurs when a learner must use these intervening technologies to communicate with the content, negotiate meaning, and validate knowledge with the instructor and other learners. Hillman, Willis, and

Gunawardena (1994) identified a fourth type of interaction as learner-interface.

Interaction in distance learning may be accomplished by means of high-technology devices that serve as the interface between the learner and his or her content, instructor, and other learners. The greater use of these devices, as well as their increasing complexity, requires an additional kind of interaction, learner-interface, in which the learner must interact with the technological medium in order to interact with the content, instructor, or other learners (Hillman, Willis, & Gunawardena, 1994).

While some authors consider "media as mere delivery vehicles for instruction that do not directly influence learning (Clark, 1983), most agree that the technology of a medium affects the modes of interaction of its users, particularly when the communication technologies are unfamiliar (Adams & Hamm, 1988; Kozma 1991). Kozma (1991) believes that different media with different attributes and capabilities can produce different learning. Further, he describes the learning process as sensitive to external environmental characteristics such as the availability and structure of information.

Transactional Approach

The concept of transaction was derived from Dewey and developed by Boyd and Apps (in Moore & Kearsley, 1996). The transactional approach describes the interplay among the environment, individuals, and the patterns of interactions in a learning situation. The transactional approach to distance learning is primarily learner-centered with fundamental objectives of purposeful interaction between the instructor and the learner and between the learners (Moore, 1983). This approach suggests that a learner-centered approach has the advantage of producing an environment where facts can be challenged and learner satisfaction can flourish (Care, 1996). The roles that the teacher assumes are that of a reinforcer, clarifier, encourager, organizer, facilitator, reassurer, praiser, supporter, confidence builder, and evaluator. There are many strategies a teacher may use to provide these roles. Moore (1983) divides the strategies into two categories, dialog and structure.

Dialog. Dialog focuses on the interplay of words, actions, and ideas that occur as interactions between the teacher and learner when one gives instruction and the other responds. The extent and nature of the dialog is determined by the educational philosophy of the individual or group responsible for the design of the course, by the personalities of teacher and learner, by the subject matter of the course, and by the environmental factors, such as class size and language (Moore & Kearsley, 1996). Holmberg (1986) placed the dialog between student and teacher as the most critical defining aspect of distance education. He suggested that distance teaching should be a guided didactic conversation, one that is aimed at facilitating learning. Organizing students into groups can stimulate discussion, problem solving, and reflection (Moore & Thompson, 1990). The teacher can assign readings to the students and facilitate discussion by asking concept-expanding questions that stimulate further thought and clarification of values held by the learners.

Students can keep journals to reflect upon their readings, classroom discussions, and application of content to their personal and professional experiences. The journals are periodically submitted to the teacher for review and feedback which stimulates teacher-student dialog. Learning contracts between the teacher and learner describe explicit objectives and learning outcomes that can individualize the learning process and promote learner independence. Interaction between the teacher and student increases when negotiating the conditions of the contract. The student can act independently in achieving the predetermined expectations described in the agreement. The teacher remains accessible to the student for guidance, direction and formative evaluation (Moore & Thompson, 1990).

Structure. Structure refers to elements in the course's design. A course consists of elements such as learning objectives, content themes, information presentations, case studies, pictorial and other illustrations, exercises, projects, and tests. The teacher is responsible for scheduling regular contact times with the learner. Being accessible for dialog and problem solving with the learner is viewed as a necessary element of any distance learning endeavor. Students feel a heightened sense of self-confidence when they know the teacher is available to assist them as necessary (Moore & Thompson, 1990).

Early meetings between teacher and students provide the students with a feeling of connection to the program and each other. Face-to-face meetings, whenever possible, help students cope with feelings of isolation inherent in the distance learning environment. In addition, choosing the right delivery methods influences the students' ability to adapt (Care, 1996).

The learning experience should include several modes of communication between the teacher and students such as telephone, fax, electronic mail, voice mail, videoconferencing. Each form of communication fosters different types of interaction and provides prompt feedback from the teacher. Availability and students' needs should be considered when selecting various modes of communications (Care, 1996).

Transactional Distance. Moore (1983) defined transactional distance as a function of the variance in dialog and structure as they relate to each other. From this perspective, distance in education is not determined by geographic proximity, but rather by the level and rate of dialog and structure. In a course with very little transactional distance, learners receive directions and guidance through ongoing dialog with their instructors and by using materials that allow modifications to suit their need, learning style, and pace. If there is neither dialog or structure, learners must make their own decisions about study strategies and decide for themselves how to study, what to study, where, in what ways, and to what extent. The greater the transactional distance, the more the responsibility a learner has to exercise leading to greater learner autonomy. The ability of a learner to reach autonomy varies. Programs should be defined and described in terms of what degree of autonomy learners are expected or permitted to exercise. The greater the autonomy a learner can manage, the greater the distance can be and the less dialog and structure are required. Teachers indicate that students using interactive technology based systems show greater responsibility for learning (Hedberg and McNamara, 1991)

In 1988, Saba proposed a system dynamics model to represent the relationship among these variables. This model assumed a systematic and dynamic relationship between dialog and structure, and suggested how a learner and a teacher, by varying the rate of dialog and structure, could control the level of transactional distance in a purposeful instructional setting. Using discourse analysis in a study of 30 students, results indicated that transactional distance varied according to the rate of dialog and structure. Specifically, an increase in the level of learner control increased the rate of dialog, which in turn decreased the level of transactional distance. The level of instructor control increased the rate of structure, which in turn increased the level of transactional distance (Saba & Shearer, 1994).

The levels of learner control and instructor control varied according to the rates of active and passive speech acts, as well as the rates of direct and indirect speech acts. Therefore, the desired instructional strategy becomes maintaining a proper balance between dialog and structure (Saba & Shearer, 1994).

In a recent study investigating the educational transaction within a videoconferencing learning environment (Chen, 1997), Moore's theory that dialog, structure, and learner autonomy affected transactional distance was only partially supported. The study employed both quantitative and qualitative approaches to research. Data were drawn from a student survey and through interviews with instructors. Findings indicated that the concepts of dialog, structure, and learner autonomy were not each singular concepts, but multifaceted ideas. When learning outcomes were assessed only in terms of the student's perception of how much he or she learned, the factors affecting learning may not be as complex as first thought.

To effectively deliver videoconference courses and facilitate learning, several practical strategies were suggested by the interviewed instructors. These strategies included additional television delivery training for teachers and learners prior to teaching or taking courses, a planned class section allowing for teacher and learners at all sites meeting in person at the beginning of a semester, setting up a listserve for online communication via electronic mail, creating group dynamics and a collaborative learning environment through group work efforts, and building consensus between or among sites through interaction among peers (Chen, 1997).

According to Gunawardena and Boverie (1993), to improve learning when using interactive technology, the instructor should: (a) provide orientation programs for distance learners to make them more comfortable with the media and methods in distance classes, (b) provide group guidance for group functioning with special attention to helping students in goal setting and building a conducive climate, (c) understand that certain learners may not want to be involved in group activities and may need alternative activities, (d) use class time for discussions by recording lectures on tape for student checkout, (e) plan interactive activities between sites, (f) develop organizers and methods of addressing the different learning styles, and (g) create support systems that include both human and non-human resources for the off-campus learner.

The Instructional Communications Systems Group at the University of Wisconsin-Madison (in Moore & Kearsley, 1996) suggests specific techniques for the course development process. They include humanizing, participation, message style, and feedback.

Humanizing refers to creating an acceptable environment to break down the feelings of separation between the instructor and students. When first encountering interactive distance learning, many educators express concern about students with no experience in learning through interactive videoconferencing and feel required to teach the students about the technology itself (Robinson, 1993), while others expect students to learn about the interactive system as they use it. Studies suggests that the instructor should provide at least one hour of orientation to the technology in an effort to achieve confidence and competence (Abbott, Dallat, Robinson, 1995) and that teaching interactive distance learning classes requires extensive training and planning (Carter, 1994).

In a study of the impact of an interactive distance learning videoconferencing network on classroom communication (Comeaux, 1995), analysis revealed that instructors who used a sense of humor in dealing with technical nuances, used a relaxed interpersonal style focusing on the interaction across the sites, and involved students directly in the course content were perceived as more successful. It also revealed that communication and interaction were hampered by the cameras, the microphones, and by the students seeing themselves on the television monitors. Thus, the findings suggest that technological classroom designs of the future need to be more conducive to the interpersonal dimensions of classroom communication to help bridge the psychological distance as well as the physical distance.

Participation deals with the extent of interaction among participants. Interactions are facilitated by posing questions, group problem solving activities, student presentations, and role-playing exercises (in Moore & Kearsley, 1996).

Message style refers to presentation techniques to enhance interest and appeal, such as, the use of short instructional segments, varying tone of voice and volume, and supplementing programs with visual aids (in Moore & Kearsley, 1996). In a study of delivery methods comparing traditional-type instructional strategies to emerging practices, findings revealed that of the emerging practices suggested by proponents and by faculty who teach distance education courses, few were practiced even minimally. A noted example was the use of lecture and questioning. Questioning, as a teaching tool, was used a great deal with students at the originating site but not with the students at the remote site. Lectures were given, but were mostly conducted in traditional format, which was long in duration and with no interactive component (Gallagher, 1998).

Feedback refers to getting information about the effectiveness of learning and teaching. Feedback can be obtained by direct questions, assignments, quizzes, polls, and questionnaires (in Moore & Kearsley, 1996).

Constructivism

Since even the best students may not learn from didactic teaching (Perrone, 1994), reformers across the curriculum have looked to constructivism, a theory for knowing (von Glasersfeld, 1992). Constructivism has become increasingly important as a foundation for the design of learning environments. When knowledge is constructed, the tools to support that construction become important. Societal demands, new visions about learning, emerging technology, and connectivity to the information superhighway are offering educators the opportunity and the challenge to rethink and restructure the way they go about designing effective learning environments (Herring, 1997).

Constructivist teachers seek out and use student questions and ideas in designing lessons, promote student leadership and collaboration, use open-ended questions, encourage students to predict outcomes, test their ideas, develop cooperative learning strategies, provide time to reflect and analyze ideas, and to respect others' ideas. The implications of this approach may mean that an interactive distance learning classroom that provides a podium and control panel for the instructor with the students sitting as members of the audience does not coincide with current reform efforts and the emerging research on how real learning occurs (Yager et al., 1995).

The new role of the teacher does not depict one who transmits knowledge but rather one who designs experiences where learners are required to examine thinking and learning processes, collect, record and analyze data, form and test hypotheses, reflect upon previous understandings, and thereby construct their own meanings (Crotty, 1995). Students must actively construct their own knowledge. The mind of the student mediates input from the instructor to mediate and construct meaning with the help of others. Distance learning environments may require the student to assume a much greater responsibility for learning than in the traditional setting. The distance learning teacher must establish an environment whereby the student is encouraged to assume that role.

Instructional systems design experts have been engaged in a dialog among themselves as to whether constructivism and instructional design are compatible. Reigeluth (1989) argues for a new mindset to combine constructivist elements within the instructional design models. Dick (1991) argues that constructivist interventions are different from instructional interventions and proposes a dual approach. A third position (Carroll, 1990) argues that the fundamental view of learning from the constructivist perspective is simply incompatible with instructional design theory. Most agree that learning is active mental work, not a passive reception of teaching. The teacher and others play an important role by providing support, challenging thinking, and serving as coaches or models.

Brenzel (1995) supports the idea of lecturing as a good intellectual exercise but with drawbacks as a passive form of communication. The amount of lecturing as a component of the typical college experience should be decreased substantially, while at the same time increasing its quality dramatically. Students need to experience, as directly as possible, the best minds in their field of interest and the give and take of real intellectual debate. Then teaching time can be better spent helping guide discussions and philosophical inquiries of their own.

Instructors need to get out of the lecture delivery business and into the management of student learning. The last thing that needs to be done is taking the bad model currently being used and putting it into an electronic format (Brenzel, 1995). The task becomes one of designing course requirements challenging the instructional design assumption that process can be separate from content (Bednar, Cunningham, Duffy, & Perry, 1992).

Lebow (1993) proposed five principles as constructivist values that might influence instructional design. These principles support the use of opportunities for learners to engage in distance learning experiences as a means of challenging students to construct their own meaning with help of others. Principle one suggests: (a) increasing emphasis on the affective domain of learning, (b) making instruction relevant to the learner, (c) helping learners develop skills, attitudes, and beliefs that support self-regulation of the learning process, and (d) balancing the tendency to control the learning situation with a desire to promote personal autonomy. Principle two recommends providing a context for learning that supports both autonomy and relatedness. Principle three recommends embedding the reasons for learning into the learning activity itself. Principle four supports self-regulated learning by promoting skills and attitudes enabling the learner to assume responsibility for the developmental restructuring process. Principle five strengthens the learner's tendency to engage in an intentional learning process, especially by encouraging the strategic exploration of errors (Lebow 1993). These principles could lay a foundation for distance learning activity using instructional design based on the constructivist paradigm.

Research in Distance Education

The application of new technologies to distance education has not only enabled more learners to participate, but the environment in which those learners function has been altered considerably. Interactive videoconferencing allows learners to meet together as a class and share information in synchronous fashion as they see each other through the aid of television cameras and screens. A traditional class can be joined by additional class members from other sites. While this option for distance education is favored by administrators and instructors because of its tremendous potential for visual interaction, some learners may not be satisfied with this new learning environment. Students used to the traditional classroom may not like sharing the class and interacting through the technology. Those students accustomed to the more isolating and independent forms of distance study may not feel comfortable with the increased demands to interact in the two-way video environment (Gruele, 1996).

Interactive Distance Learning

While research studies in applying effective instructional strategies to student motivation, interactions and achievement in traditional classroom settings are plentiful (Brophy & Good, 1986; Gagne' & Glaser, 1987; Romberg & Carpenter, 1986), far fewer studies consider those aspects in respect to interactive distance learning (Coggins, 1989). Many distant learners require support and guidance to make the most of their distance learning experiences (Threlkeld & Brzoska, 1994). This support typically takes the form of some combination of learner-instructor and learner-learner interaction. Research findings on the need for interaction have produced some important guidelines for instructors organizing courses for distant students.

According to Thompson, Simonson, and Hargrave (1992), one of the most important factors in overcoming transactional distance, as described by Moore and Thompson (1990), appears to be adapting the instruction to not only meet the needs of learners, but to also take advantage of the characteristics of the instructional content and the strengths and limitations of interactive television through the use of varied instructional strategies. Students should be allowed to develop self-directed learning skills.

A study of the impact of learning styles on instructional design for distance learning examined the interaction of adult learning styles and the media (Gunawardena and Boverie, 1993), instructional strategies, and group functioning in a distance learning class that used audiographics and computer-mediated communication. The results of the study indicated that whether students are on-campus or off-campus is a better indicator than differences in learning styles of how students interact with media. The conclusion was that learning styles alone does not seem to be a good indicator of how students interact with media in a traditional or a distance setting. However, learning styles do affect attitudes concerning students' opinions of class discussions, group activities, and group presentations by others. Since there is evidence that instructors teach the way they were taught, to develop positive attitudes and perceptions of interactive distance learning technologies, teachers need training in how to utilize those technologies most effectively (Herring, Smaldino, & Thompson, 1995).

On-site facilitators or mediators who develop a personal rapport with students and who are familiar with equipment and other course materials increases student satisfaction with courses (Burge & Howard, 1990). According to MacKinnon, Walshe, Cummings, and Velonis (1995), site bias, where more attention is given the local site where the instructor is located, creates frustration with the remote neglected learners. Whereas, a facilitator can help manage a site by directing the learners' attention, switching cameras and monitoring the process, a curriculum expert, or mediator, can provide content support by answering questions to consolidate the learners' understanding. A mediator manages activities at the remote site on behalf of the instructor and focuses more attention at the mediator's site. A good mediator can help the learners overcome camera and microphone shyness and therefore increase interactions by stimulating conversation face-to-face. Teaching for interaction requires spontaneity and risk on the part of the instructor and learners alike. Mediators must be deliberate in inviting learners to interrupt instructors to ensure dialog rather than monologue (MacKinnon et al.). The use of technologies such as fax machines, computers, and telephones provide learner support and interaction opportunities. Close camera views can improve communication between the instructor and learners at the remote site.

Effectiveness of interaction between instructors and interactive videoconference participants has not been widely documented. Specific criteria for effective interaction in distance learning are still being developed. One of the difficulties in determining interaction effectiveness may be that interaction differs according to the kind of instruction involved (Ritchie, 1991).

A study by Ritchie (1991) found that the kind of instruction, lecture or discussion, influenced the number of interactions but did not determine who interacted. His study indicated that the frequency of interactions occurring within a face-to-face setting is usually limited but even fewer interactions occurred when communicated via electronic media. When compared to a traditional classroom, studies show verbal interactions over electronically mediated instruction were less frequent, shorter in duration, more serious in content, somewhat business-like, and very task-oriented. Previous studies have also indicated that non-verbal communication was diminished (Hiemstra, 1982).

Instruction using interactive technology with traditional approaches has little chance of increasing the interaction. Therefore, techniques other than those used in traditional face-to-face instruction are needed to realize the potential of interactive technology used in distance learning (Moore, 1989).

Some reasons why the interchange of ideas in distance learning requires different communication methods than in conventional classrooms are: (a) information technologies are predominately a visual medium, rather than the textual and auditory environment of the conventional classroom; (b) the affective content of technology-mediated messages is muted compared to face-to-face interaction; and (c) complex cognitive content can be conveyed more readily in electronic form because multiple representations of material (e.g., animations, text, verbal descriptions, visual images) can be presented to give learners many ways of understanding the fundamental concept. According to Dede (1990), good teachers in distance learning use different pedagogical approaches than they would in face-to-face interactions for the same reason that a skilled actor would portray a role differently for a movie camera than for a stage audience.

Surprisingly, the instructor's physical absence appears to have no adverse effect on learning. In fact, interactive videoconferencing may actually stimulate group cohesiveness (Abbott, Dallat, Robinson, 1995). It has been a consistent phenomenon that after the initial shock of being apart from the instructor, students report a positive attitude toward their interdependence they develop in teleconferencing as a result of the instructor's distance (Moore, 1992). Students express a growing sense of autonomy and professional development, both as individuals and as a group (Abbott, et al. 1995). However, students are more likely to interact verbally when the instructor is present (Bauer & Rezabek, 1993). To increase interaction in independent group activities, Moore (1992) recommends short illustrations by instructors, followed by group work at each site and then across sites.

Learner Attitudes and Perceptions

In a study designed to examine the perceptions of distance education of 210 undergraduate and graduate students, the students agreed that the most ineffective part of their interactive television class involved technical problems. Students indicated that they did not learn as much in the interactive television class as they would in a regular class (Isman, 1997).

Research has found that student satisfaction and perceived learning in distance education are affected by the availability of interaction. When students interacted regularly with the instructor and other students, increased motivation and higher quality learning experience were reported (Shale & Garrison, 1990). Fulford and Zhang (1993) found that students' perceptions of high levels of classroom interaction corresponded to higher levels of satisfaction. When the instructor is inexperienced in working with the technology, maintaining a high degree of interaction often proves difficult.

In a study of students enrolled in interactive distance learning classes, the instructors were enthusiastic, in spite of perceived inadequacies in their own training in the technology and some misgivings about the effective functioning of the equipment. Instructors and students alike tolerated technical malfunctions, but instructors were careful not to show their frustration when things went wrong. Students' comments indicated that interaction between sites was affected as instructor concentration was split between teaching and dealing with the technology (Abbott, Dallat, Robinson, 1995). Instructor frustrations or reduced concentration may represent only one factor that can reduce interactions.

In a case study of the impact of students' preferred learning style in an interactive videoconference course, results indicated learning style preferences may affect academic achievement and the attitude of students involved in distance learning (Gee, 1990). Other factors may include the very nature of the medium and the way in which a learner interacts by asking and responding to questions.

In a study of interactions between the instructor and university students at local and remote sites linked by interactive videoconferencing (Sholdt, Zhang, & Fulford, 1994), learners perceived no significant difference in interacting with the instructor when asking questions or responding to the instructor. Learners did perceive it to be significantly easier to ask questions or respond to other learners at the same site rather than at a different site. This suggests the importance of the physical presence of the other learner in learner-learner interaction.

Sholdt et al. (1994) observed that students at the local site had limited contact with other students at the remote site and the students at the remote site were seldom viewed on the screen. When they were on screen, it was viewed at a distance rather than close-up. Students perceived responding to a question to be easier than asking a question with learners of a different site. However, the students found asking a question to be easier than responding to a question at the same site. Sholdt et al. suggest that the learner who is asking the question is willing to miss information, whereas, the individual being asked may not want to divert attention away from the instructor.

In practice, Cheng, Lehman, and Reynolds (1991) suggest that it is often too time consuming to provide opportunity for every student to participate in a discussion except where everyone's input is essential. Typically, discussion only includes a small number of students. Combined with the difficulties in interacting through a technology medium, the effect can become an increasingly difficult problem. The key may be what Kruh and Murphy (1990) describe as vicarious interaction where learners are participating internally by silently responding to questions. Anticipated interaction has been linked to positive learner attitudes.

In a study of anticipated interaction (Yarkin-Levin, 1983), students who were told that they would have subsequent interaction (e.g. questions from the instructor) had attitudes that were more positive and recalled more facts than did those who did not anticipate interaction. If learners' perceptions of interaction remain high through vicarious or anticipated interaction, these perceptions may promote positive feelings toward the instruction. In another study, results further suggest that learner satisfaction may be attributed more to perceived overall interactivity than to individual participation. Instructors teaching through interactive video probably should be more concerned with overall group dynamics than with engaging every individual equally or with soliciting overt individual responses (Fulford & Zhang, 1993).

Since perception and satisfaction are affective characteristics, design strategies relevant to the affective domain should be used. Keller (1987) provides a framework for designing learning strategies to increase the perception of interaction in a class through a model of motivational categories which include attention, relevance, confidence, and satisfaction. The heuristic theory was derived from a synthesis of many areas of research related to human motivation. It addresses questions about how to design strategies for instruction that will stimulate or sustain students' motivation. The first element in student motivation is to arouse and sustain their curiosity and attention. This can be accomplished by introducing startling or unexpected events, which arouse a perceptual level of curiosity or engages the learners in inquiry oriented behavior that stimulates a deeper level of interest. After the student's attention has been obtained, the material must be perceived as relevant to his interest or goals. The learning experience may enhance their current view of themselves and their feelings of being important. High achievers enjoy situations that allow them to set goals and standards. A sense of enthusiasm from the teacher for the student's goals can help generate similar feeling in the student. Students need to believe that there is a reasonable chance of success. When students feel confident, in control, and expect success, their motivation is high. To continue that motivation, students require reinforcement, feedback, intrinsic rewards, and evaluation (Keller, 1987).

The impression that students form of others may prove to be a strong motivational factor in the interactive environment (Fulford & Zhang, 1993). Participants make use of different kinds of information in forming their impressions. Communicating using video may change the patterns of attention to information, with resulting changes in impression formation. Current technology limits some of the visual and aural cues that govern normal conversation patterns (Heath & Luff, 1992). The slight delays in transmission because of compressed video and audio signals make interrupting an ongoing stream of speech difficult. Consequently, brief remarks sometimes do not appear to change the distribution of talk within a group (Sellen, 1992). Side conversations within a group at one site are typically inaudible, although visible, to participants at another site and are usually interpreted by participants at the other site as rude (Mantei et al., 1991).

In fact, these side conversations may be productive clarifications of material presented, but the information discussed is rarely communicated to the other site. Visual cues that lead to impressions are often obscure when close-up views of the participants are omitted. Abrupt movement to achieve those views can be disruptive to the message. While participants are waiting for the event to begin, local participants frequently chat informally with each other and share personal information when entering and leaving the room. Little opportunity exists between sites to exchange personal views and attitudes that lead to impression formation and increased participant satisfaction and interaction (Storck & Sproull, 1995).

Interactive video users often say that video meetings are more tiring than face-to-face meetings (O'Connaill, Whittaker, & Wilbur, 1993). The impact of the higher cognitive workload in the video environment may be due to the social information being harder to obtain from the remote site and limited cognitive capacity for absorbing other performance information or the cognitive capacity may simply be more directed toward the local site or toward the students at the remote site who are already known. The number of students participating at each site may contribute to this effect.

Good pedagogy is important to students' perceived satisfaction with distance education. Students acclimate to the instructional reality of traditional, campus-based face-to-face instruction, or technology-mediated distance education. Once accustomed, it is the quality and effectiveness of instructor and instruction, not the technology, that is associated with satisfaction. Ongoing technical support and training for operation of the technology are important to students enrolled in technology-mediated distance education (Debourgh, 1998).

In a study of distance learning between remote sites and local sites (Wick, 1997), there were no significant mean score differences in final achievement between students; however, significant differences in student attitudes did occur. On-site students stated that distance learning classes are more interesting than traditional classes, and remote site students said they would rather take traditional classes. The researcher concluded that students in remote settings depend upon an enhanced use of traditional discussion, questions and answer, and participation with other students to feel a sense of connection to the teacher and the class. In addition, students expect the medium to be used in ways that will take advantage of its special visual and auditory capabilities. Until these two factors are satisfactorily addressed, students will anticipate enrollment in distance education as a poor substitute for the traditional classroom experience.

Forty-three undergraduate students at a large mid-western university were subjected to the same videoconference experience, except that half were exposed to a close-up of the instructor's head and the other half viewed a far shot of the instructor. Results indicated that the close-up group scored significantly higher than the far group when tested. Findings suggest that a videoconferencing environment designed to create the impression of social distance may enhance the ability to recall information and positively affect the attitudes concerning the experience (Ellis, 1992).

In a longitudinal field study of high school students, Storck and Sproull (1995) demonstrated that participants could achieve the same level of performance in video interaction as they do in face-to-face. However, the impressions of others formed by those across video are different from and less positive than the impressions they form in face-to-face interactions.

At the beginning of the course, students at all three sites were similar in terms of basic demographics. The students were also similar in their perceptions of one another and their level of knowledge of the other sites. Only one site differed statistically across the sites. The desire-to-work-with measure was highly correlated with measures of persuasiveness, friendliness, and confidence. Measures of information efficiency and impression formation were presented from the point of view of the person providing the measure. Everyone in the shared classroom space formed impressions of and evaluated each of the other students. Some of the impressions were the result of face-to-face interaction and the others were the result of video interaction. Students at the remote site learned as much knowledge as did students who were face-to-face with the instructor, as measured by course grades. The performance outcomes of information delivery tasks did not differ between students using face-to-face and interactive videoconferencing (Storck and Sproull, 1995).

Student evaluations of local student presentations did not significantly predict the instructor's assessment as measured by grade. However, for students who evaluated other students through the video medium, peer ratings of presentation quality and project content predicted the instructor's assessment. Although everyone saw the same student presentation, peers evaluated students with high communication anxiety lower when they observed them via video than when they observed them face-to-face (Storck and Sproull, 1995).

Students reported that they got to know each other over the course of the semester in both face-to-face and over video. However, increases in peer acquaintanceship were greater for students at the same site. Peers who came to know one another in a face-to-face setting reported that their impressions of each other became somewhat more positive, as measured by the desire-to-work-with measure. Desire to work with peers known only through video decreased slightly. Neither of these changes was statistically significant. However, the distribution of the desire-to-work-with measure included a large number of neutral ratings, which perhaps masked the effects of the medium (Storck and Sproull, 1995).

After eliminating the neutral ratings, there was a statistically significant difference between desire-to-work-with face-to-face peers and video peers, both at the beginning of the course and at the end of the course. Ratings of face-to-face peers increased and ratings of video peers decreased. The results support that students form more positive impressions of face-to-face peers than of video peers; in part due to an unexpected decrease in positive impressions of the remote peers (Storck & Sproull, 1995).

The video medium may also carry expectations of on-camera competence due to the cultural association of interactive video with broadcast television. Attention to the monitor is conditioned by experience with broadcast television. Commercial breaks, channel flipping, and television programming condition the viewer to selective attention and heuristic processing characteristics. Students may be more charitable toward their face-to-face peers because they do not have the same expectation of face-to-face as that of professional quality, video presentations. The likelihood of ever meeting the other person face-to-face contributes to their lack of familiarity (Storck & Sproull, 1995).

Classroom teachers rely on a number of visual and unobtrusive cues from their students to enhance their delivery of instructional content. A quick glance, for example, reveals who is attentively taking notes, pondering a difficult concept, or preparing to make a comment. The student who is frustrated, confused, tired, or bored is equally evident. The attentive teacher consciously and subconsciously receives and analyzes these visual cues and adjusts the course delivery to meet the needs of the class during any particular lesson (MacKinnon et al., 1995).

In contrast, the distant teacher has few, if any, visual cues. Those cues that do exist are filtered through technological devices such as video monitors. It can be difficult to carry on a stimulating teacher-class discussion when technical requirements and distance alter spontaneity. Videoconferencing has been examined to determine the effects of manipulating the perceived proxemic distance between students and an on-screen instructor concerning students' recall and attitude response ratings. Results indicate that a videoconferencing environment designed to create the impression of social distance might enhance ability to recall information and positively affect attitudes concerning the videoconferencing experience. Designers of mediated learning environments should consider the nonverbal communication construct of perceived proxemic distance early in the design phase of course development (Ellis, 1992).

Learner Characteristics

The primary role of the student is to learn. Under the best of circumstances, this challenging task requires motivation, planning, and the ability to analyze and apply the information being taught. In a distance education setting, the characteristics of the student learning is more complex for several reasons (Schuemer, 1993). Many distance-education students are older, have jobs, and families. They must coordinate the different areas of their lives that influence each other – their families, jobs, spare time, and studies. Some students are interested in obtaining a degree to qualify for a better job. Many take courses to broaden their education and are often not interested in completing a degree. In distance learning, the learner is frequently isolated. The motivational factors arising from the contact or competition with other students is absent. The student also lacks the immediate support of a teacher who is present and able to motivate and, if necessary, give attention to actual needs and difficulties that occur during study. Distant students and their teachers may have little in common in terms of background and day-to-day experiences and therefore, it takes longer for student-teacher rapport to develop (Schuemer).

Without face-to-face contact, distant students may feel ill at ease with their teacher as an individual and uncomfortable with their learning situation. In distance education settings, technology is typically the conduit through which information and communication flow. Until the teacher and students become comfortable with the technical delivery system, communication will be inhibited (Morgan, 1991).

Cognitive speed theory has demonstrated that the average reading speed of most Americans is twice the rate of speech. This suggests that if the learner is not engaged in a situation in which interaction is required, their less productive thought patterns may emerge to dominate their cognitive activity (Taylor, 1965; Carver, 1982; Fulford & Zhang, 1993).

Beginning students may have some difficulty determining what the requirements of a course of academic study actually are because they do not have the support of an immediate peer group, ready access to the instructor, or familiarity with the technology being used for delivery of the distance-education course. They may be unsure of themselves and their learning. Morgan (1991) suggests that distant students who are not confident about their learning tend to concentrate on memorizing facts and details in order to complete assignments and write examinations. Therefore, they develop poor understanding of course material.

Morgan (1991) views memorization of facts and details as a surface approach to learning. This approach may be identified by students focusing on discrete elements, memorizing information and procedures for tests, unreflectively associating concepts and facts, failing to distinguish principles from evidence, new information from old, treating assignments as something imposed by the instructor, and placing an external emphasis on the demands of assignments and examinations leading to a knowledge that is cut-off from everyday reality.

Distant students are required to become more selective and focused in their learning in order to master new information. The focus of their learning needs to shift them from a surface approach to a deep approach. Morgan (1991) describes this approach as distinguishing new ideas and previous knowledge, relating concepts to everyday experience, organizing and structuring content, and by focusing on how instructional material relates to everyday reality.

Brundage, Keane, and Mackneson (1993) suggest that adult students and their instructors must face and overcome a number of challenges before learning takes place by being responsible for themselves, owning their strengths, desires, skills and needs, maintaining and increasing self-esteem, relating to others, clarifying what is learned, redefining what legitimate knowledge is and dealing with content.

High motivation is required to complete distant courses because the day-to-day contact with teachers and other students is typically lacking. Instructors can help motivate distant students by providing consistent and timely feedback, encouraging discussion among students, being well prepared for class, and by encouraging and reinforcing effective student study habits (Brundage et al., 1993).

Students are required to recognize their strengths and limitations. They must understand their learning goals and objectives. The instructor can help distant students to explore their strengths and limitations and their learning goals and objectives by assuming a facilitative role in the learning process. Providing opportunities for students to share their personal learning goals and objectives for a course helps to make learning more meaningful and increases motivation (Brundage et al., 1993).

Distant students may be afraid of their ability to do well in a course. They are often balancing many responsibilities including employment and raising children. The instructor can help maintain student self-esteem by providing timely feedback. It is critical for teachers to respond to students' questions, assignments, and concerns in a personalized and pleasant manner, using appropriate technology such as fax, telephone, or electronic mail. Informative comments that elaborate on the individual student's performance and suggest areas for improvement are especially helpful (Brundage et al., 1993). Students often learn most effectively when they have the opportunity to interact with other students.

Interaction among students typically leads to group problem solving. When students are unable to meet together, appropriate interactive technology such as electronic mail is required to encourage small group and individual communication. Assignments, in which students work together and then report to the class as a whole, encourage student-to-student interaction. The instructor must ensure clear directions and realistic goals for group assignments (Burge, 1993).

Distant students require reflection on what they are learning. They need to examine their existing frameworks of knowledge and how they are being added to or changed by incoming information. Examinations, papers, and class presentations provide opportunities for student and teacher to evaluate learning. However, less formal methods of evaluation will also help the students and teacher to understand learning. For example, periodically during the course the instructor can ask students to write a brief reflection on what they have learned and then provide an opportunity for them to share their insights with other class members (Burge, 1993). Brundage et al. (1993) suggest that adult learners may find it difficult to accept that their own experience and reflections are legitimate knowledge. If the instructor takes a facilitative rather than authoritative role, students will see their own experience as valuable and important to their further learning. Burge (1993) suggests having learners use first-person language to help them claim ownership of personal values, experiences, and insights.

Student learning is enhanced when content is relevant. Instructors tend to teach using examples that were used when they received their training. For distance learning to be effective, however, instructors must discover examples that are relevant to their distant students. The distant instructor should encourage students to find or develop examples that are relevant to them or their community (Brundage et al., 1993). Learning will be more meaningful and deeper for distant students, if the students and their instructor share responsibility for developing learning goals and objectives, actively interact with class members, promote reflection on experience, relate new information to examples that make sense to learners, maintain self-esteem and effectively evaluate what is being learned (Burge & Roberts, 1993).

The inability to achieve learner-interface interaction successfully can also be a significant problem to those comfortable with the technology yet unfamiliar with the specific communication protocols required to interact with the tools to accomplish a desired task or outcome. In technologically mediated communications, the learner who is unskilled in interacting with the communication medium must dedicate the majority of his or her mental resources to retrieving the information, thus leaving fewer resources available for learning the lesson content. The interface becomes an independent force with which the learner must contend (Hillman, Willis, & Gunawardena, 1994).

This effect can be evident as the instructor struggles with the camera controls, or positioning of materials on the television monitors, or a student who forgets to turn on the microphone before speaking. The learner's potential fear of working with the technology can be a significant impediment to successful interactions and subsequently to learning the content. To maximize interactions and learner achievement, facilitators of interactive distance learning systems must develop ways to help the instructors and students to overcome the interface of the technology (Ritchie & Newby, 1989).

In an attempt to sustain a level of interactive learning comparable to that of a traditional class, organizers in the form of written copy of lectures and relevant unpublished printed material provide assistance. With a balanced design approach, or variety of modes of presentation and structures, learners focus on those attributes that best suit their preferred mode of thinking. The concept of the balanced design assumes that there are no conflict or interference effects between simultaneous presentations in different modes. More research is needed to investigate the effectiveness of balanced designs (Smith, 1993).

Smith (1993) states that the effectiveness of interactive instructional strategies is determined by the characteristics of the learner, the mode of presentation of the instructor, and the organization of contents of the instruction. Although existing research in interactive distance education is inconclusive concerning the effect of learning style preferences on achievement, course design and assessment play a critical role in determining what learning and cognitive styles are best suited for the content and interactive instruction. Studies indicate that the field independent learner is more likely to succeed at distance learning (Wilson, 1991). Pre-tests and profile cards should be used to identify the student's interests, level of knowledge, and learning and cognitive styles (Price and Repman, 1995).

Summary

As interactive distance learning becomes more prevalent, strategies to improve and to enhance interaction between the participants should be developed. Studies indicate a positive relationship between increased interactions and students' attitudes, perceptions, and learning. To increase interactions, a purposeful effort in instruction to reduce transactional distance is required through increased dialog and structure as defined by Moore (1992).

These efforts may include humanizing the technology, getting the learner actively involved through participation, and developing an effective message style for instruction. Learners benefit significantly from their involvement in small learning groups. These groups provide support and encouragement along with extra feedback on course assignments. Most importantly, the groups foster the feeling that if help is needed, it is readily available.

As institutions embrace technology, designers and developers endeavor to incorporate strategies that emulate the instructor-student interaction of a traditional classroom. Ultimately, it is with the learner's interaction with the technology that determines if distance learning succeeds or fails (Hedberg and McNamara, 1991). While visual presence of others who are geographically distant creates a strong sense of social presence and may create the warm environment which some need, it does not seem to add much to the learning process in strict cognitive terms (Burge & Roberts, 1993).

With new technologies such as fiber optics, compressed video, and interactive videoconferencing emerging, continued research is needed to describe and refine the nature of the distance learning process and the changes in instructional strategies for their effective use (Miller & Clouse, 1994). Research from this study may provide additional insight into the process of interactive distance learning and describe specific instructional strategies when using interactive videoconferencing technology in higher education learning.

Chapter 3

Methodology

This chapter defines the researcher's role, the research design, background and setting, triangulation of the data, a sampling description, and the data collection procedures. Details of the observation schedules and protocols for Case A and Case B are followed by descriptive questions and interview sample questions.

The methodology of this research contains elements of qualitative and quantitative designs. The observational data included both descriptive text and coded information. Instructor and student interviews were conducted to provide insight into the nature of the interactions during the observation periods.

Researcher's Role

The primary roles of the researcher in this study are that of an observer, interviewer, interpreter, and evaluator. The researcher's background includes that of an administrator, teacher, and educational technology specialist at a higher education level for more than 18 years. He developed customized curricula used in training faculty and students in computer applications, telecommunications, networking and videoconferencing. As a member of the university distance learning advisory council, he participated in developing the videoconferencing systems that linked these and other institutions. No attempt was made by the researcher to become involved in the instructional process or classroom activities. The researcher maintained a neutral perspective toward distance learning and technology in an attempt to objectively describe the events as they occurred without prejudice or a predisposed interpretation.

Design

Case is the phenomenon of interest occurring in a bounded system. It is the unit analysis for a case study (Miles & Huberman, 1994). The phenomenon of interest here is interactive videoconferencing in higher education courses. For the context of this study, interactive refers to the communication between all participants in the course, including instructor, students, mediator, and facilitator. The term mediator refers to the instructor's assistant, whereas, a facilitator merely provides technical support. Because of scheduling and the nature of the technology, boundaries are defined in terms of time and place. The observation period was limited to one semester over a three-month period.

Background and Setting

The university system was composed of eight institutions on ten campuses in five cities. The primary site is located in the southern states and was recognized as a doctoral granting, research university with 30,000 students on campus. The remote site was located approximately 250 miles away at a smaller four-year institution that also offered graduate programs in many areas.

In the fall of 1995, a point-to-point, two-way, interactive videoconferencing system was installed to link the primary campus, referred to as local, with the distant campus, referred to as remote. Interactive videoconferencing enables the university to provide alternatives to students that might otherwise be impossible because of travel distance, availability of experienced instructors, or expenses that occur when duplicating programs at several campuses. In the spring of the 1996 semester, six courses were offered; two of which are the focuses of this study.

A history course traced the social, political, and economic development of Southeastern Europe from 1878 to the present. The reading consisted of five books that provided insight into Balkan culture and attitudes. Some of the class time was designated as open discussion to review the books. Grading was based on mid-term, final examination, and participation in class discussion, especially when reviewing the outside readings. Graduate students were required to complete extra work. Another course examined the nature and importance of adult education, social and psychological factors affecting adult motivation and learning, and techniques for providing adult learning experiences.

Both courses were offered as three-credit-hour, senior-level, undergraduate studies. Enrollments were limited to 24 students at each location; however, only a small number of students enrolled at the distant location. The history class met every Monday, Wednesday, and Friday from 8:30 a.m. to 9:30 a.m. and the adult education class met Monday from 4:30 p.m. to 7:30 p.m.

Instructor Backgrounds

The instructor for the history class earned a Ph.D. in Arts and Sciences and began teaching in 1968. He is considered by many as an expert in his field and an accomplished presenter. For several years, he taught Eastern European and Balkan history and has written several books and articles on the Hapsburg Monarchy and its policies in the Balkans in the 18th century. While recognized as a content expert, he had limited experience with distance learning. This was his first course to teach using interactive videoconferencing technology.

The instructor for the adult education class earned her Ph.D. in Adult Education in 1989 and has taught distance learning courses in the past. Her experiences include video production playback on public television and teaching computer courses to business and industry using computer presentation software. While experienced with classroom technology, this was her first experience in interactive videoconferencing.

Meetings to prepare the instructors, conducted by staff members of the department responsible for operating the facility, began in two months prior to the start of the semester when the classes were offered. Each meeting focused on some aspect of preparation. The first meeting lasted approximately one hour and informed the instructors on how to prepare materials for presentation in the class and about services that were available to assist them. The second meeting addressed the individual needs of each instructor. The third meeting provided a two-hour demonstration and orientation to the interactive videoconferencing facilities and technology. The fourth meeting gave each instructor opportunity to rehearse using a mock audience and a simulated class presentation.

Neither instructor visited the remote site prior to or during the case study. For the purposes of this study the history class will be referred to as Case A and the adult education class as Case B. The distance learning locations where the instructor presented will be referred to as the local site and the distant location as the remote site.

Distance Learning Environments

Each site contained three cameras: (a) one focused on the instructor, (b) one that panned the classroom, and (c) a stationary camera to display documents. Camera signals were feed into a personal computer controlled by software that digitized and compressed the video signals before sending them through the telephone lines. The signal was then received uncompressed on a monitor.

There were two television monitors at the front and rear corners of the classrooms. The monitor on the left side usually displayed a close-up view of the instructor, items placed under the document camera, a computer presentation display, or a wide angle view of the students at the local site while the other monitor on the right side showed the students at the remote site. The student cameras usually provided a wide-angle view of the classroom but could zoom in on individual students for close-ups.

The motorized cameras were manually adjusted and switched by the instructor, mediator, or student presenter at a console in the front of each classroom. The instructor wore a lavalier microphone clipped on his collar and students spoke into nearby microphones on top of the desks.

The remote site contained four (4) tables with eight (8) chairs each of three (3) rows. The desks were small but seemed adequate. A large projection screen hung at the front of the room above an old dusty chalkboard. A document camera pointing down from a stand was positioned at the front desk for the instructor. A fax machine was perched on a rolling cart nearby the equipment console at the far right side of the classroom toward the front (see Appendix A for a diagram of the classroom facility).

There were two 21-inch monitors at the back of the room and two larger 35-inch monitors at the front corners. From the students' perspective, the desks were skewed to the right side of the room resulting in poor visibility. The chalkboards were not used during classes but displayed schedule information. A bulletin board at the front had four (4) sheets of paper with scheduling and promotional information about the room.

A glass window at the rear of the room provided for video and film projectors and a viewing area outside the classroom. Two small windows were covered to prevent light and distractions from outside the building. The class bells seemed to be ringing on a different schedule than the classes because they rang in the middle instead of the beginning and end of the class period. There were two video cameras, one at the front pointed at the students and one at the back pointed at the instructor's console desk.

Twelve microphones were placed on the desks, one for each pair of students. There were four speakers in the ceiling but the sound came from two separately mounted amplified speakers on each side of the front of the room next to the television monitors.

The campuses were linked via a broadband (T1) telephone line that carries both the audio and compressed video signals. Video compression can cause some loss of picture quality and produce a somewhat jerky quality in the motion of people and objects. Also, there was a slight delay between interactions to avoid feedback noise and confusion caused by simultaneous conversations. In addition to the actual online class time, Internet and FAX access were available for students at the remote site to correspond with their instructor.

Triangulation of Data

In any intrinsic study, the researcher should recognize the need not only for being accurate in measuring things but logical in interpreting the meaning of those measurements. In the constructivist's view, there is always more than one interpretation when studying complex observations. Triangulation of the data substantiates an interpretation or clarifies its meanings (Stake, 1995). According to Patton (1990), there are four basic protocols for triangulation that contribute to verification and validation of qualitative analysis: (a) data source, (b) analyst, (c) theory, and (d) methodological.

In this study, triangulation of the data source was attained by comparing the observations collected during three concentrated efforts at the beginning, middle, and end of the courses and the interviews of the instructors, students, and mediator to seek different interpretations of the experience. Triangulation of methods includes collecting and analyzing observation data using both quantitative and qualitative methods as presented in sections concerning protocols and categorical details.

Sampling

According to Patton (1990), there are three kinds of sampling errors that can arise in qualitative research designs: (a) distortion in the situations being observed, (b) distortions introduced by the time periods of the observations, and (c) distortions of selectivity in the participants for observations or interviews. To better understand the situation and the performance of the software used to collect the observational data, a pilot group was selected from courses offered in the preceding semester. The pilot study group was selected based on similarity to the expected student characteristics of the courses that were to be included in the study.

The two courses selected for this study were similar in classification level and provided instructors with contrasting instructional strategies. Minor distortions of time periods occurred as a result of course scheduling at contrasting times of the day and on different days of the week, during the same semester. The class in Case A met for one hour each on Mondays and Wednesdays in the mornings and the class in Case B met on Monday evenings for three hours with a 15-minute break in the middle.

The samples included students enrolled in the courses offered during the observation period. Case A began with 29 students but was reduced to 24 enrollments due to class size restrictions. The remote site maintained an enrollment of four students throughout the observations. Case B included 17 students at the local site and five students at the remote site. The students at the remote site traveled together from a nearby town approximately 75 miles away. Purposive sampling was used when selecting student informants for interviews.

A release form secured written permission from participants. The form identified the researcher's role, permission for classroom observations and recordings, use of artifacts, course grades, and demographic data. Instructors informed the students of the researcher's intent to periodically observe, interview, and collect data (see Appendix B for details of the release form).

Data Collection Procedures

To assure confidence in the trustworthiness of the conclusions to be drawn from the study, several sources of evidence were employed. Data were collected through observations, interviews, and analysis of artifacts. A pilot study was conducted before collecting observation data to gain insight into the process and to test the data collection software. Based on the pilot study, enhancements to improve performance and tracking of camera changes, technical delays and group discussion were added to the software.

Observation data were collected over the course of a semester at three specified times: (a) before-class, (b) during-class, and (c) after-class. The before-class and after-class observations were approximately 5-10 minutes in duration. The during-class observation duration varied with each class but followed a predetermined schedule indicated in a class syllabus. Unless otherwise noted, the term "observation", times, and duration refer to during-class observations.

Case A observations included nine observations beginning in January at the local site and alternating to the remote site every two observations with the last observation occurring in May at the local site. Each during-class observation lasted approximately 45 minutes between 8:40 a.m. and 9:30 a.m. The local site observations for Case A included three hours and 41 minutes of observation time and the remote site included three hours and one minute for a total observation time of six hours and 42 minutes.

Case B observations included four observations beginning in January at the remote site followed by one local site observation and then two remote observations in April. Each during-class observation lasted approximately one hour and 20 minutes between 4:40 p.m. and 6:00 p.m. The local site observation for Case B included one hour and 27 minutes of observation time and the remote site included three hours and 47 minutes for a total observation time of five hours and 14 minutes (see Table 1 for schedule details).

Table 1

Case A Observation Schedule.

Observation		Time			
#	Location	Date	Start	Stop	Duration
1	Local	01/17/96	8:42:45	9:31:50	49:05
2	Local	01/19/96	8:43:28	9:32:44	49:16
3	Remote	01/22/96	8:47:53	9:31:58	44:05
4	Remote	01/24/96	8:43:44	9:31:20	47:36
5	Local	02/07/96	8:43:58	9:15:51	31:53
6	Local	03/11/96	8:41:35	9:31:06	49:31
7	Remote	04/10/96	8:44:41	9:27:37	42:56
8	Remote	05/01/96	8:40:00	9:26:55	46:55
9	Local	05/03/96	8:44:33	9:25:59	41:26
Total for Local					3:41:11
Total for Remote					3:01:32
Total Duration					6:42:43
Average Duration					44:45

(table continued)

Case B Observation Schedule.

Observation			Time		
#	Location	Date	Start	Stop	Duration
1	Remote	01/22/96	4:37:09	6:03:58	1:26:49
2	Local	01/29/96	4:38:27	6:05:36	1:27:09
3	Remote	04/08/96	4:45:02	6:00:21	1:15:19
4	Remote	04/29/96	4:35:36	5:40:52	1:05:16
Total for Local					1:27:09
Total for Remote					3:47:24
Total Duration					5:14:33
Average Duration					1:18:38

Note: The before-class observations preceded the time in the start column and the after-class observations followed the time indicated in the stop column. The Duration column represents the during-class time only.

Interviews were conducted using pre-constructed questions in a guided, open-ended format. In Case A, nine students at the local site were interviewed between observations for approximately 10 minutes, six by telephone and three in person. Interviews were conducted with the four students at the remote site as a group following the observation periods (2, 5, and 7). In Case B, seven students at the local site were interviewed between observations for approximately 10 minutes, three by telephone and four in person. Interviews were conducted with the students at the remote site as a group of five following the observation periods (1, 2, and 4). For analysis, the interview data were grouped by similarity into six local site and 20 remote site responses. Each instructor was given a 30-minute interview at the end of the course. After analyzing their responses, each instructor was given an additional 30-minute, follow-up interview.

Observation Protocol

For collecting classroom observational data, Flanders's Interaction Analysis (Flanders, 1970) was adapted to accommodate the use of videoconferencing technology. This data collection protocol was one of the procedures widely used during the 1960s for studying the verbal interactions between the instructor and students in the classroom. This protocol was selected because of its sensitivity to pedagogical styles rather than to curricular content (Stake, 1995).

The original protocol recorded primarily instructor and student behavior. Teacher behavior was categorized as indirect praise or acceptance of feelings, influence to clarify or solicit a student response, and direct lecture, providing directions, or criticizing. The student behavior included responding or initiating conversation with the instructor, or responding and initiating conversation with other students. Behaviors were segregated by location into local and remote sites. Brief pauses, silence, periods of confusion, and discussions were categorized as other (see Appendix C for details of Flanders Interaction Analysis).

Field notes in the form of comment entries described the teaching style of the instructors, class preparations, use of organizers, implementation strategies, types of evaluation, classroom management styles, and the use of facilitator or mediator strategies. Neither Flanders's Interaction Analysis Protocol nor the Observation Protocol Software provided direct coding for a mediator or facilitator. Events and comments concerning the interactions of the mediator and facilitator were usually entered as general observations.

Observation Protocol Codes

To observe specific characteristics of the technology, categories were added for camera changes, equipment malfunctions, and general observations related to the technology. Codes were recorded in real time by data entry into a computer (see Table 2 for the modified observational protocol codes).

Table 2

Modified Observation Protocol Codes.

Instructor	
Indirect	
I1	Accepts and clarifies feelings in a non-threatening manner.
I2	Praises or encourages actions or behavior. Jokes that release tension.
Influence	
I3	Acceptance of ideas of student or clarifying.
I4	Asks questions about content or procedure to solicit response from student.
Direct	
I5	Lecturing facts, opinions about content or procedure.
I6	Giving directions.
I7	Criticizing a student to change behavior.
Students	
Responsive	
S1	Student response to instructor solicited by the instructor.
S2	Response of student to another student.
Initiative	
S3	Initiated talk of student to the instructor. Instructor refers to student only to recognize who may speak.
S4	Student-to-student initiated. Instructor-to-student only to recognize who may speak.

(table continued)

General Observations	
O1	General observation or comment.
O2	Brief delay, silence, confusion, or distraction.
O3	Group discussion.
O4	Delay due to technical problems or adjustment.
O5	Camera change or comment.
O6	Document camera reference.

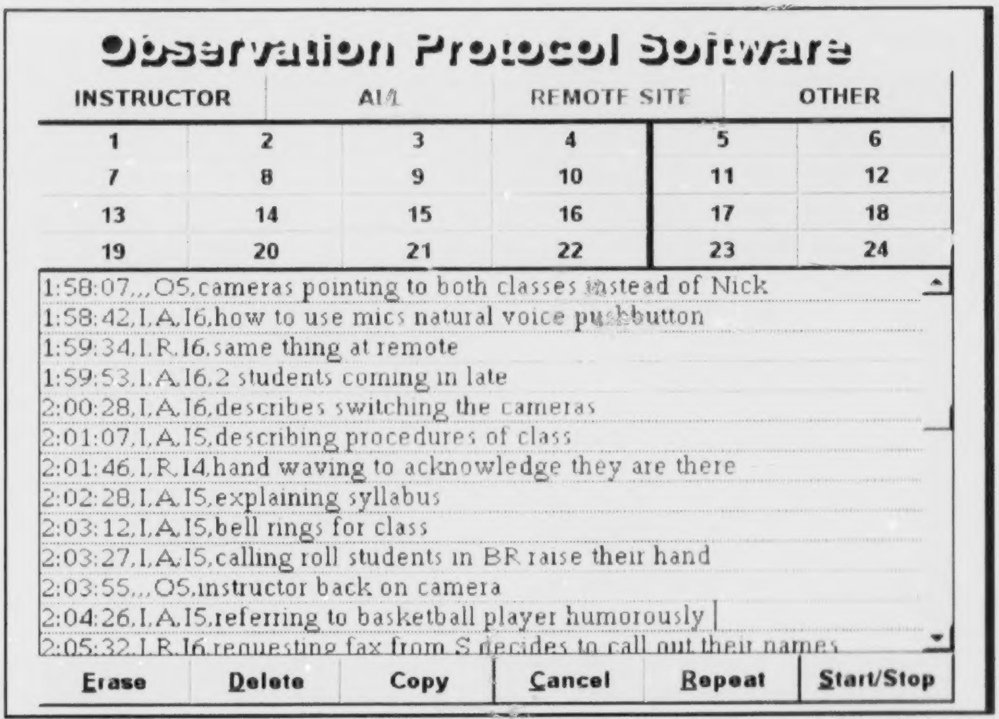
Observation Protocol Software

The data entry program, Observation Protocol Software - OPS (1996), was designed and developed by the researcher using Asymetrix ToolBook II™, Version 5 (1994). ToolBook II (1994) is a software construction set used to develop Windows™ (1993) applications. ToolBook II (1994) applications have all the features of Windows (1993) applications including a graphical user interface (GUI), event-driven programming, and the ability to interact with other Windows applications without requiring the time and effort of using a low-level language. ToolBook II (1994) is used to create hypermedia applications such as online encyclopedias, interactive training applications, tutorials, or information kiosks and for database applications like OPS.

The Observation Protocol Software uses a graphical user interface to enter and store information into a database in real time as the observation or event occurs. ToolBook II (1994) provides an interactive environment for both creating and running the application (see Appendix D1 for an example of OPS using the ToolBook editor). By clicking the mouse at the menu bar or on icons located at the top of the editor, drawing tools are selected to create the visual interface of the application with graphics, buttons and fields. A programming language, called OpenScript™ (1994), defines what happens when a user clicks a button in the application (see Appendix D2 for a program segment of OPS written in the OpenScript programming language). ToolBook II (1994) handles all the tasks of communicating with Windows to display elements on screen and detect mouse clicks and keystrokes.

A ToolBook II (1994) application consists of one of more files called books. Like a printed book, a book in ToolBook II is divided into pages, which represent the application's screens. The pages are viewed in windows called viewers. The pages contain fields, buttons, and graphics. The pages and the items on them are called objects in ToolBook II (1994). Each page can have different objects, or objects can be shared among pages by placing them on a background, which is common to several pages. The book is viewed one page at a time in a ToolBook II (1994) window, or viewer.

OPS contained one viewer with four pages. The main page provided buttons and fields for entering the events as they occur (see Figure 1 to view the main page). The other pages appeared as needed with lists of appropriate choices based on the type of event that was entered.


Observation Protocol Software
INSTRUCTOR
AIM
REMOTE SITE
OTHER
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
Erase
Delete
Copy
Cancel
Repeat
Start/Stop

```
1:58:07,,,O5,cameras pointing to both classes instead of Nick
1:58:42,I,A,I6,how to use mics natural voice pushbutton
1:59:34,I,R,I6,same thing at remote
1:59:53,I,A,I6,2 students coming in late
2:00:28,I,A,I6,describes switching the cameras
2:01:07,I,A,I5,describing procedures of class
2:01:46,I,R,I4,hand waving to acknowledge they are there
2:02:28,I,A,I5,explaining syllabus
2:03:12,I,A,I5,bell rings for class
2:03:27,I,A,I5,calling roll students in BR raise their hand
2:03:55,,,O5,instructor back on camera
2:04:26,I,A,I5,referring to basketball player humorously
2:05:32,I,R,I6,requesting fax from S decides to call out their names
```

Figure 1. Observation Protocol Software main page with buttons and fields for entering the event data during the observations.

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ToolBook II (1994) is an object-oriented environment. All of the visual elements in an application, such as buttons, fields, graphics, viewers, and the pages and backgrounds, are objects. Each object has a set of properties that define the object's appearance and behavior. For example, a field has properties such as fillColor and position that determine its color and location, and others such textAlignment and fieldType that define how it displays text and allows users to enter data. Every object has several properties that define its appearance and behavior. An object browser is used to view and edit object properties. The browser shows a hierarchical view of pages and their objects, backgrounds and viewers. After selecting an object in the browser, the property editor displays the built-in and user properties associated with that object.

Most of the objects in the Observation Protocol Software are buttons that represent events that are anticipated during a observation. The properties of the buttons, such as color, position, and shape, were defined to indicate the type of interaction. The buttons at the top of the screen for the instructor and students are blue, "ALL" students (refers to the entire class) in purple, students at the remote site in green and the "OTHER" category is red. These buttons are for selecting the source and target of the interaction that is observed. The series of numbered buttons below the first row allow the user to select the local student by a pre-assigned number and position. The number of the local student is recorded with the observation code so the student can later be identified for analysis. The middle section stores the observation codes and comments in the order in which they occur. Each line represents one observation. The data is entered as text that can be scrolled, copied, and pasted directly into other Windows applications. Several editing buttons are provided at the bottom of the screen for deleting, copying, canceling or repeating an observation entry.

To use OPS, a runtime version of ToolBook II (1994) is needed with Microsoft Windows 3.1® (1993), Windows 95® (1995), Windows NT® 3.5 (1994) or higher, a Windows-compatible computer with a 80486/33 processor or higher, a Windows-compatible mouse or other pointing device, a CD-ROM drive, a hard disk with 30MB of free disk space, depending on the options you choose during setup, at least 8MB of random-access memory (RAM); however, 12MB or more is recommended, and a graphics adapter card (VGA, SuperVGA, or other Windows-compatible card)capable of displaying at least 256 colors at 640x480 pixel resolution. The researcher used a 486 notebook computer with a 10-inch LCD panel and power adapter.

The Observation Protocol Software provided buttons for starting and stopping the data entry process and for selecting the appropriate codes for the observation. To enter an observation, a button was clicked to identify the source that initiated the event, either the instructor, local student, remote student or entire class followed by selecting the target of the interaction that responds. A new screen appeared with a list of choices describing the types of interactions from which to choose (see Appendix E1, E2, and E3 to review OPS screens for choosing instructor, student, and other types of events). After selecting a choice by clicking the mouse on item in the list, the display returned to the main screen and entered the coded observation into the event list on the screen followed by a comments section for entering a brief description of the nature of the observation.

Most observations described interactions between the instructor and students, however, some events such as camera changes, technical problems, delays, and the use of the document camera were indicated as "OTHER". When selecting "OTHER", an area on the screen was provided to enter a brief description of activities. After entering the last observation, clicking the stop button completed the process. A database of the completed observation represented a chronologically timed sequence of events. The observation data were saved to the hard disk drive of the notebook computer and later transferred via high density, 1.4MB, 3.5-inch diskettes to a desktop system for compiling reports and analyzing the observations. For analysis, the text data were copied into Microsoft Word® for editing and formatting, and then stored as a standard text file.

Interviews

One focus of this study was to obtain the descriptions and interpretations of others. Spradley's Descriptive Question Matrix (1980) provided a structure for developing questions used to collect data during the interviews. Questions included aspects of space, objects, acts, activities, events, time, actors, goals, and feeling; especially related to perceptions of the participants.

Descriptive questions were developed immediately following each observation and varied depending on responses during the interviews. Pre-constructed questions provided a starting point for inquiry. The following pre-constructed descriptive questions were used in this study:

1. Describe the classroom environment.

2. How are activities determined by actor positions?

3. When should interactive videoconferencing not be used in the classroom?

4. What is the impact of electronic presentations on learning.

5. Describe the interaction of participants during the class.

6. How does instructor preparation play a role in interactive videoconferencing?

7. What single factor would improve this classroom experience and learning? How?

8. Describe the sequence of events in the class.

9. Does using interactive videoconferencing require more, less, or the same amount of time in class? Why?

10. What is the role of the participants?

Telephone interviews, approximately 10 minutes in length, were conducted to uncover the multiple realities relevant to the inquiry. Selected informants were questioned in person at greater length, approximately 30 minutes, to focus on details as they surface. Student interviews were conducted following several of the classes to develop insight into the attitudes and perceptions of the students. Repetitive items were included as a means of recording changes over time. To avoid any distractions of recording devices, only notes were taken during the interviews of the students. The following sample questions were used when interviewing students:

1. How does your interaction affect the interaction of others?

2. Which classroom activity did you find most beneficial? Why?

3. Describe your note taking.

4. What was your expectation of this class?

5. How does this class meet your needs?

6. Did the technology discourage your interaction? If so, how?

7. Describe how your interactions with the instructor are different from a traditional classroom.

8. What single factor would improve this class?

9. What is your attitude toward distance learning?

10. Would you take this class again?

Instructors received informal conversational interviews guided by pre-constructed questions before the observations began and at the end of the semester following the last observation. The following questions were used during the first interview of the instructors:

1. Describe your attitude toward distance learning via interactive videoconferencing.

2. Describe the students' attitude toward distance learning via interactive videoconferencing.

3. How does instructor preparation play a role in interactive videoconferencing?

4. Should students prepare in any way for the class? If so, how?

5. Describe the sequence of events during a typical class.

6. How would you describe the interactions between you and the students?

7. Describe the local and remote interactions between the students.

8. How does your interaction affect the interaction of others?

9. Which classroom activity did you feel was most beneficial for the student? Why was it beneficial?

10. Explain what single factor would improve this experience.

11. Describe when interactive videoconferencing should not be used for teaching.

Follow-up interviews were conducted with the instructors using restructured questions. The following questions were used during the follow-up interview with the instructors:

1. How has your teaching in the distance learning classroom evolved or changed as a result of your experience in this context?

2. In the distance learning setting, which instructional or learning activities have you found to be the best fit for you and for your course content?

3. What is your role in these activities?

4. What are your expectations of the learners at both the delivery and remote sites?

5. How are they similar or different?

6. How do these expectations differ from those you hold for students in a traditional classroom?

7. What, if any, are the major hindrances or limitations that you have encountered as you conduct classes in the distance learning classroom?

8. Describe any changes in the strategies you use now in the traditional classroom as a result of your experiences in the distance learning environment.

The instructor interviews were audio recorded and converted to transcript for analysis. See Appendix F for an overview of the information collected for this study including observations of before-class, during class, break in the middle of a class, after class, video and audio tapes, instructor and student interviews and transcripts.

Verification

Following collection of the data, the researcher obtained responses from selected student informants. The instructors were asked during their interviews to substantiate the students' remarks.

External Validity

The purpose of an intrinsic study is not to represent the world, but to represent the case studied. The primary responsibility of the researcher is in understanding the case. Although case study seems a poor basis for generalization, "petite generalizations" , or smaller generalizations that occur throughout a particular case, may be possible (Stake, 1995, p.7). Thus, the "grand generalization" of a study through sample and other conditions may not be valid.

Qualitative research does try to establish an empathetic understanding for the reader, through descriptions of particular perceptions or detailed descriptions of the actors (Geertz, 1973), conveying to the reader what experience itself would convey (Stake, 1995). Thick descriptions, experiential understanding and multiple realities are the essential components of a qualitative study. Generalization becomes the responsibility of the reader. This researcher's expectation is to provide a context-rich and meaningful understanding of the interactive videoconferencing process when used in a higher education environment.

Chapter 4

Results

This chapter reports the results of the research. Following a description of the analysis tools, Cases A and B are analyzed independently followed by a comparison of the two cases. Each case analysis is divided into two sections, Observation Protocol Analysis and Categorical Analysis. The first section presents data collected during the observations which are arranged according to the protocols as prescribed in the adapted version of Flanders's Interaction Analysis.

The Categorical Analysis section includes textual data from the observation events and interviews. It provides details concerning the nature of the events and captures the essence of the experience as interpreted by the researcher, instructor, selected students, and mediator.

Using the interaction model described by Moore (1989) and later appended by Hillman et al. (1994), the textual data in the categorical sections are grouped into the following categories: (a) Learner-content, (b) Learner-instructor, (c) Learner-learner, and (d) Learner-interface. These categories provide a framework for summarizing interactions that occur in distance learning environments (Moore, 1989).

According to Moore and Kearsley (1996, p.128), the first type of interaction that an instructor must bring about, or assist, is the interaction between the student and the subject matter. This interaction with content is "the defining characteristic of education." The learner constructs knowledge through a process of personally accommodating information into previously existing cognitive structures. After the content has been presented, learner-instructor interaction provides opportunity to bring meaning to the content. The instructor can stimulate the learner's interest and his or her motivation to learn while allowing for clarification of any misunderstandings by the learner concerning the content. The instructor can provide support and encouragement as the learner interacts with the content. The learner draws on the experience and perceptions of the instructor through discussion of the content.

Learner-learner interactions are typically verbal but may include visual cues displaying attitudes during class discussions. Formal presentations by the students can encourage development of their expertise and test their knowledge as scholars and abilities as teachers. Organizing teams for presentations to their peers can create an interactive environment for the students. Learner-learner interactions may occur outside the classroom without the instructor being present or in the classroom without his awareness.

Successful interaction in the mediated educational transaction is highly dependent upon how comfortable the learner feels in working with the delivery medium such as switching on the microphone when speaking. Learners need to possess the necessary skills to operate the mechanisms of the delivery system before they can successfully interact with the content, instructor, or other learners (Hillman et al., 1994).

Data Analysis Tools and Procedures

According to Stake (1995), there is no particular moment when data analysis begins; rather, it is an ongoing process throughout the study. Two strategic ways that researchers reach new meanings about cases are through direct interpretation of the individual instance and through the aggregation of instances until something can be said about them as a class (Stake, 1995).

The nature of the study, the focus of the research questions, and the curiosities of the researcher determined the analytic strategy to be followed. Immediately following observations and periodic interviews, the data were reviewed for "correspondence or patterns" that could lead to new discovery (Stake, 1995, p.38). Based on the responses, new questions were asserted for future interviews. For example, observing the failure of some of the students to use the switch properly on the microphone when speaking led to specific interview questions about their frustration and comments concerning their behavior.

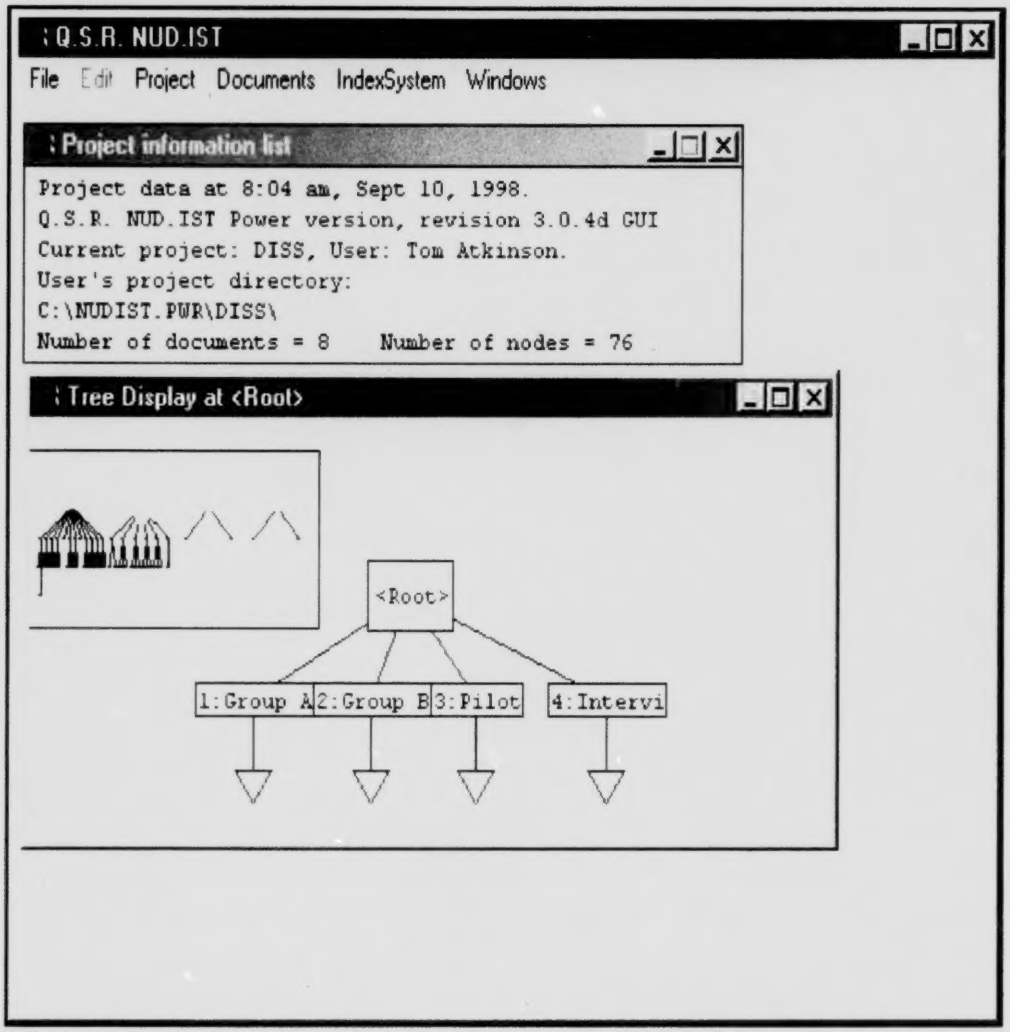
Statements to reflect or bring meaning and understanding were recorded with the observational data and checked against research questions to confirm their efficacy or raise new issues. However, no conclusion was determined until all data were collected and analyzed. The following analysis is divided into four main sections: (a) description of the data analysis tools and procedures, (b) analysis of Case A, (c) analysis of Case B, and (d) a comparison of Cases A and B.

The observation data were collected and coded using the Observation Protocol Software developed by the researcher. The data were copied into Microsoft Word (1997), edited and saved as standard text files. The text files were then imported into NUD.IST software for indexing and analysis.

NUD.IST Analysis Software

NUD.IST (1996), non-numerical, unstructured data indexing, searching, and theorizing, is a computer program designed to aid users in handling text-based data in qualitative analysis. NUD.IST helps users to manage, explore and search the text of documents, manage and explore ideas about the data, link ideas and construct theories about the data, test theories about the data, and generate reports including statistical summaries.

NUD.IST creates an indexed database that allows the researcher to define and relate concepts and categories relevant to the data and to index the data using those categories. New theories can be constructed and tested by exploring their links with data. NUD.IST helps create such categories for thinking about the data, and manage those categories in an index system with an unlimited number of index categories. The categories and subcategories are stored at the nodes of hierarchical tree structures (see Figure 2 for a view of the main menu screen).



Q.S.R. NUD.IST
File
Edit
Project
Documents
IndexSystem
Windows
Project information list
Tree Display at <Root>
<Root>
1:Group A
2:Group B
3:Pilot
4:Intervi

```
Project data at 8:04 am, Sept 10, 1998.
Q.S.R. NUD.IST Power version, revision 3.0.4d GUI
Current project: DISS, User: Tom Atkinson.
User's project directory:
C:\NUDIST.PWR\DISS\
Number of documents = 8    Number of nodes = 76
```

Figure 2. NUD.IST main menu screen displaying first level nodes of the observation data.

The nodes are automatically assigned and indexed for reference by name and location in the structure. The structure begins at the root level and branches to the groups of data representing Case A, Case B, Pilot Study,

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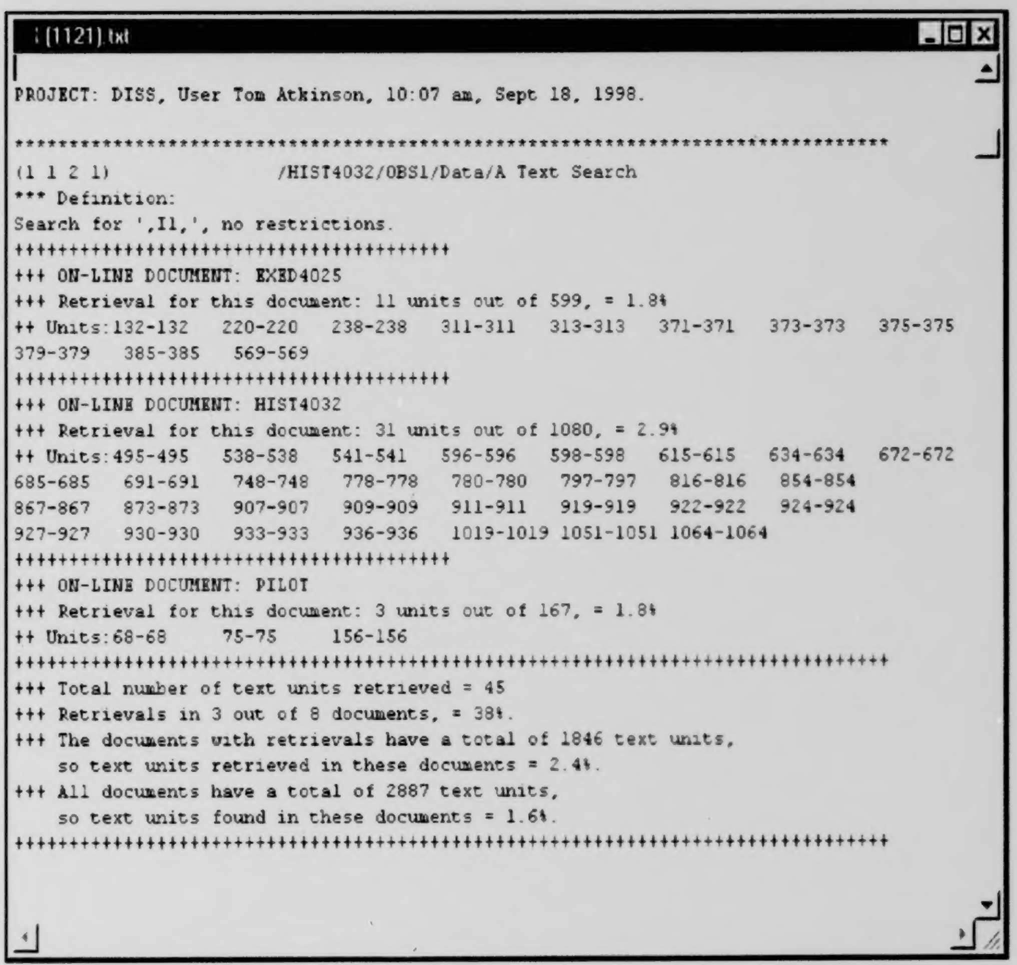
and Interviews. An overview of the node structure appears in the upper left area of the tree display. A close up view of the nodes with text labels highlights the current position in the tree structure.

The nodes may be listed with definitions and related information and can be altered, reorganized or deleted. Memos record emerging theoretical understanding and explanations in a node. Reports can be generated for all the references to passages of text at a node, from all or selected documents for interpretation and analysis.

The researcher searches the index system for combinations of index references expressing answers to simple or complex questions and stores the results of text or index system searches as new categories for further exploration of the data. A report on any node or the text indexed at it can be edited, saved, or printed without affecting the node.

A document database was created to store all observational and interview data. The text data were stored in the NUD.IST database for editing, searching, investigating and reporting. In NUD.IST, a document is any source of data. A document is a file of plain ASCII text, no formatting required, which can be introduced into the database of a NUD.IST project (see Figure 3 for a view of a search data report).

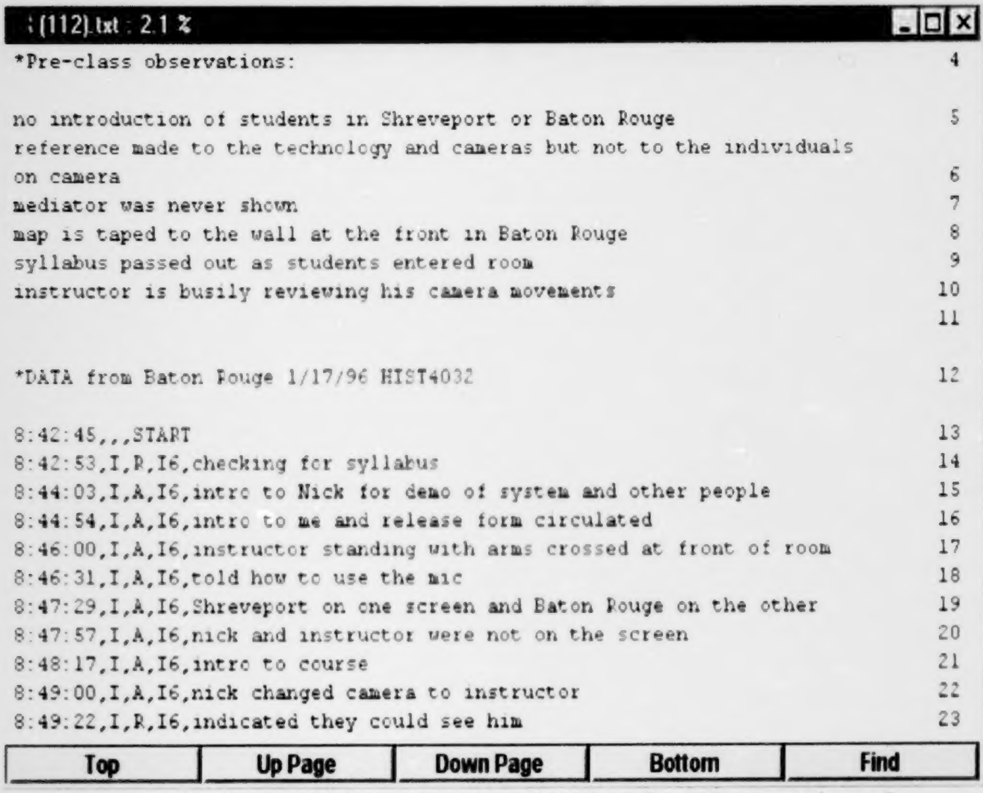


```
PROJECT: DISS, User Tom Atkinson, 10:07 am, Sept 18, 1998.

********************************************************************************
(1 1 2 1)              /HIST4032/OBS1/Data/A Text Search
*** Definition:
Search for ',I1,', no restrictions.
++++++++++++++++++++++++++++++++++++++++
+++ ON-LINE DOCUMENT: EXED4025
+++ Retrieval for this document: 11 units out of 599, = 1.8%
++ Units:132-132   220-220   238-238   311-311   313-313   371-371   373-373   375-375
379-379   385-385   569-569
++++++++++++++++++++++++++++++++++++++++
+++ ON-LINE DOCUMENT: HIST4032
+++ Retrieval for this document: 31 units out of 1080, = 2.9%
++ Units:495-495   538-538   541-541   596-596   598-598   615-615   634-634   672-672
685-685   691-691   748-748   778-778   780-780   797-797   816-816   854-854
867-867   873-873   907-907   909-909   911-911   919-919   922-922   924-924
927-927   930-930   933-933   936-936   1019-1019 1051-1051 1064-1064
++++++++++++++++++++++++++++++++++++++++
+++ ON-LINE DOCUMENT: PILOT
+++ Retrieval for this document: 3 units out of 167, = 1.8%
++ Units:68-68     75-75     156-156
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++ Total number of text units retrieved = 45
+++ Retrievals in 3 out of 8 documents, = 38%.
+++ The documents with retrievals have a total of 1846 text units,
    so text units retrieved in these documents = 2.4%.
+++ All documents have a total of 2887 text units,
    so text units found in these documents = 1.6%.
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
```

Figure 3. NUD.IST text search data report of Case A observations listing all references that contain the code "I1" representing instructor initiated events that solicit a student response.

Each document contains a header with brief text that describes the document and a body, which is divided into text-units. The body is the text of the file, and each text-unit is the text between successive carriage returns. Text-units are coded or indexed for investigating relationships (see Figure 4 for a view of the observational data).



```
*Pre-class observations:                                                  4

no introduction of students in Shreveport or Baton Rouge                  5
reference made to the technology and cameras but not to the individuals
on camera                                                                 6
mediator was never shown                                                  7
map is taped to the wall at the front in Baton Rouge                      8
syllabus passed out as students entered room                              9
instructor is busily reviewing his camera movements                      10
                                                                         11

*DATA from Baton Rouge 1/17/96 HIST4032                                  12

8:42:45,,,START                                                          13
8:42:53,I,R,I6,checking for syllabus                                     14
8:44:03,I,A,I6,intro to Nick for demo of system and other people         15
8:44:54,I,A,I6,intro to me and release form circulated                   16
8:46:00,I,A,I6,instructor standing with arms crossed at front of room    17
8:46:31,I,A,I6,told how to use the mic                                   18
8:47:29,I,A,I6,Shreveport on one screen and Baton Rouge on the other     19
8:47:57,I,A,I6,nick and instructor were not on the screen                20
8:48:17,I,A,I6,intro to course                                           21
8:49:00,I,A,I6,nick changed camera to instructor                         22
8:49:22,I,R,I6,indicated they could see him                              23
```

Figure 4. NUD.IST document database of observational data for Case A including before-class, coded data, and the after-class events.

Worksheet Analysis Software

For further analysis and reporting, the NUD.IST data were imported into Microsoft Excel (1997) worksheets. Tables were created for the pilot Study, Case A, Case B, and the instructor and student

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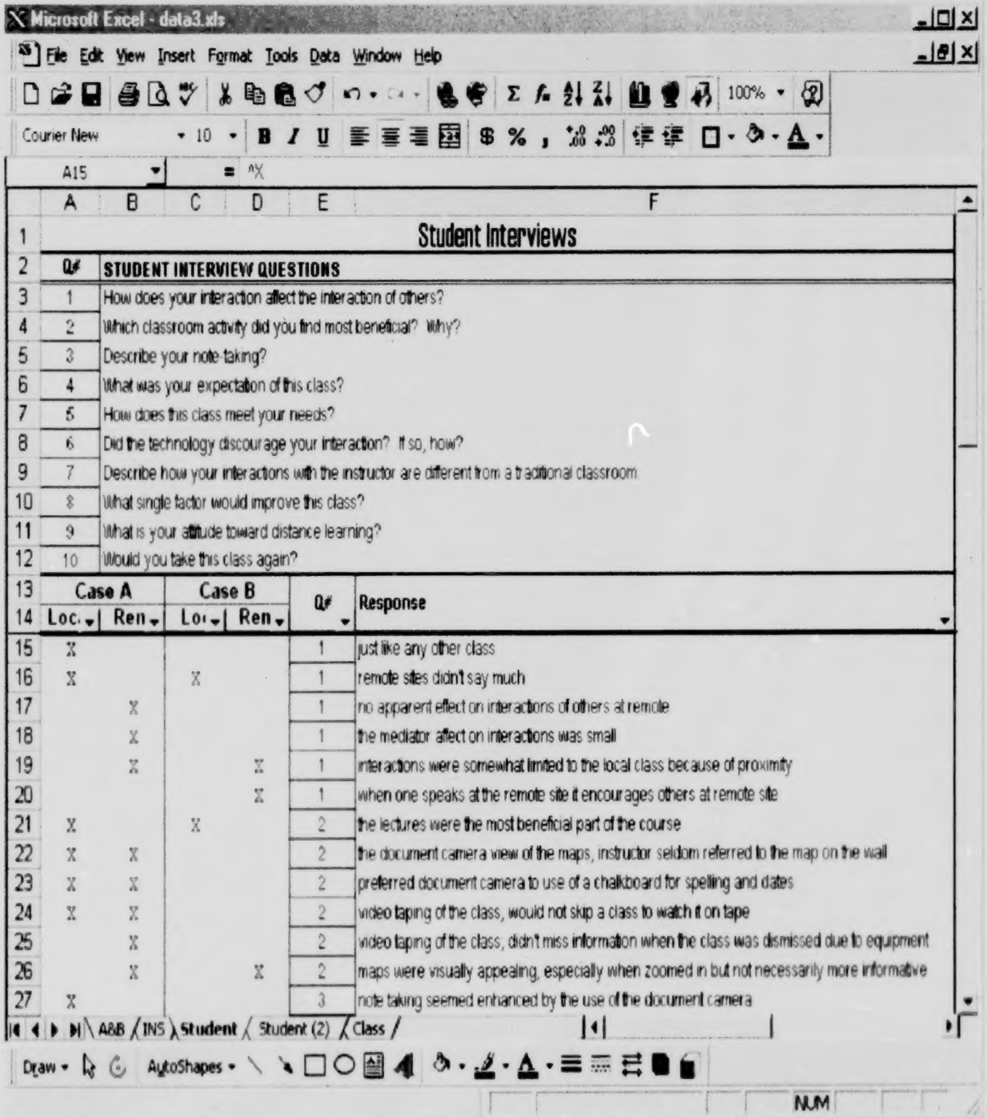
interviews. The worksheets provided greater flexibility in analyzing the empirical data and for producing graphical representations.

The observation data were organized into chronological order and transferred into one worksheet for the pilot data; into nine worksheets for Case A; and into four worksheets for Case B. Each worksheet included text-box areas for entering notes during the analysis. The observation data were segregated into columns for time of the event, duration, source and response of the interaction, type of code and comments. The before and after class details were categorized separate from the event data for analysis. Case B, Observation 2 included details during a break at the middle of the observational period. A video recording of Case A, Observation 1, was reviewed to establish consistency between on-site observations and a pre-recorded playback of the same observational period.

The observation data were analyzed by frequency, time, and duration to identify repetition or patterns of categorical data. Time ordered and event matrices were sorted and filtered to help identify the patterns. Worksheet views of the instructor and student interviews and classroom perceptions were created for analysis (see Figure 5 for a view of an excel worksheet of student interview data).



Student Interviews

	Q#	STUDENT INTERVIEW QUESTIONS
3	1	How does your interaction affect the interaction of others?
4	2	Which classroom activity did you find most beneficial? Why?
5	3	Describe your note-taking?
6	4	What was your expectation of this class?
7	5	How does this class meet your needs?
8	6	Did the technology discourage your interaction? If so, how?
9	7	Describe how your interactions with the instructor are different from a traditional classroom
10	8	What single factor would improve this class?
11	9	What is your attitude toward distance learning?
12	10	Would you take this class again?

13	Case A		Case B		Q#	Response
14	Loc.	Ren	Lo	Ren		
15	X				1	just like any other class
16	X		X		1	remote sites didn't say much
17		X			1	no apparent effect on interactions of others at remote
18		X			1	the mediator affect on interactions was small
19		X		X	1	interactions were somewhat limited to the local class because of proximity
20				X	1	when one speaks at the remote site it encourages others at remote site
21	X		X		2	the lectures were the most beneficial part of the course
22	X	X			2	the document camera view of the maps, instructor seldom referred to the map on the wall
23	X	X			2	preferred document camera to use of a chalkboard for spelling and dates
24	X	X			2	video taping of the class, would not skip a class to watch it on tape
25		X			2	video taping of the class, didn't miss information when the class was dismissed due to equipment
26		X		X	2	maps were visually appealing, especially when zoomed in but not necessarily more informative
27	X				3	note taking seemed enhanced by the use of the document camera

Figure 5. Excel worksheet of student interview data.

Additional worksheets with combined data were produced for compiling the observation schedule,

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frequency and duration matrices, report summaries, graphs and charts. The matrices contain data in columns for the initiator, respondent, type of code for the pilot study, Case A, Case A-Video, Case B, and the total number of events and percentages of each code. Bar graphs were generated to analyze the frequency and duration data.

For videotaping the observations, the researcher placed a small, 8mm camcorder at the left front of the room to view the students and the television monitors at the back of the room. The researcher sat at a desk in the back corner of the room with a notebook computer for taking notes.

The lighting was a bright fluorescent but darkened at the front of the room behind the instructor's desk. The lights glared on the surface of the monitors but visibility was adequate. At the front of the room, there was a vinyl tile floor with a slightly raised carpeted area behind the instructor's desk.

Analysis of Case A

The following analysis was divided into two sections, Observation Protocol Analysis and Categorical Analysis. The first section presents data collected during the observations which were arranged according to the protocols as prescribed in the adapted version of Flanders's Interaction Analysis. The analysis was arranged into four subsections: (a) Instructor events, (b) Student events, (c) Camera events, and (d) Mediator events. The mediator was unique to Case A. Mediator events were not specifically included in the adapted protocols but were derived from the researcher's comments that were made as they related to other events.

The Categorical Analysis section provides an analysis of the textual data obtained from field notes, comments entered in the OPS, and interviews. It provides details concerning the nature of the events and represents the patterns and essence of the experience as interpreted by the researcher, instructor, selected students, and mediator.

Observation Protocol Analysis

Nine observations were conducted at the local site beginning in January and alternating to the remote site every two observations with the last one occurring in May at the local site. Each observation period lasted approximately 45 minutes between 8:40 a.m. and 9:30 a.m. There were 673 events recorded during six hours and 42 minutes. The instruction was presented in primarily lecture format with supplemental films and maps and occasional directed, group discussions during book reviews. Class began with 29 students but later decreased to 24 enrollments due to class size restrictions and the remote site included four students. Students were seated in no particular order or arrangement.

At most observations, before class would begin and following the dismissal of class, students gathered at the instructor's desk for informal discussions. Data, in the form of field notes, were collected during this time by the researcher. The field notes contained 87 comments that described activities observed at local and remote sites before (46 comments) and after (41 comments) the class observation periods. These comments mostly described interactions that occurred between the instructor and the students at the local site but also included the mediator and students at the remote site.

Instructor Events. The instructor events represent the interactions initiated by the instructor toward the students. Most of the instructor events (61%) were directed toward all of the students. A total of 214 instructor-to-entire-class events were delivered in a primarily lecture format. As predicted by previous research (Moore, 1989), a higher incidence of events were directed toward the students at the local site (76) than the students at the remote site (61) (see Table 3).

Table 3

Comparison of Instructor to Local, Remote, and Student Events for Case A.

Target	Frequency Count	
Instructor-to-entire-class	214	61%
Instructor-to-local-students	76	22%
Instructor-to-remote-students	61	17%

The majority of the instructor-to-local-students events (85%) were concentrated in Observations 5, 6 and 9; whereas, the majority of the instructor-to-remote-students events (86%) were concentrated in Observations 1, 5, 6, 7, and 8. Fewer than three remote events occurred in each of the other observations.

As defined by the observation protocols, the instructor events were categorized by seven types: (a) Accepts and clarifies, (b) Praises or encourages, (c) Acceptance of ideas, (c) Ask questions to solicit a response, (e) Lecturing, (f) Giving directions, and (g) Criticizing. While most instructor events were directed toward all of the students during lecturing and questions, the instructor demonstrated a high degree of acceptance and praise toward the students with 90% toward students at the local site and 77% toward students at the remote site (see Table 4).

Table 4

Frequency of Instructor-to-Student Events by Type for Case A.

Type of Event	Frequency of Event					
	Local		Remote		Entire Class	
(a) Accepts and clarifies	12	16%	20	33%	2	1%
(b) Praises or encourages	21	27%	11	18%	7	3%
(c) Acceptance of ideas	36	47%	16	26%	4	2%
(d) Asks questions to Solicit a response	5	7%	6	10%	44	21%
(e) Lecturing content	2	3%	0	0	136	63%
(f) Giving directions	0	0	8	13%	21	10%
(g) Criticizing	0	0	0	0	0	0
Totals	76		61		214	

Note: Percentages are calculated by column to represent the percent of the event type.

Acceptance and support events accompanied comments by the instructor such as "that's interesting" or "yes, that's right, very good". Of the 138 events coded as lecturing content, 55 events were questions, intended to solicit a response from the students. Most questions were directed toward the entire class rather than individual students. With only a few exceptions, questions directed toward an individual student were follow-ups to questions initiated by the students.

Student Events. The student events were categorized by four types: (a) Response-to-instructor, (b) Response-to-student, (c) Initiated-to-instructor, and (d) Initiated-to-student. There were more local (71), initiated student-to-instructor type occurrences than remote (51). The "Entire-Class" events occurred when several students responded simultaneously to the instructor or to other students. Of the 192 student events that occurred during the observations, 122 events involved students at the local site, 67 events involved students at the remote site, and three events involved the entire class (see Table 5).

Of the initiated-to-instructor type of events, 20 events were students at the remote site requesting that the instructor remind others to turn on their microphone when speaking. Fifteen events occurred during Observation 5 with questions during an instructor led discussion of a book review. In Observation 6, 24 initiated-to-instructor type of events occurred when students had questions pertaining to a pending exam.

Table 5

Frequency of Student Events by Type for Case A.

Type of Event	Frequency of Event					
	Local		Remote		Entire Class	
(a) Response-to-instructor	50	41%	16	24%	1	33%
(b) Response-to-student	1	1%	0	0	0	0
(c) Initiated-to-instructor	71	58%	51	76%	2	67%
(d) Initiated-to-student	0	0	0	0	0	0
Totals	122		67		3	

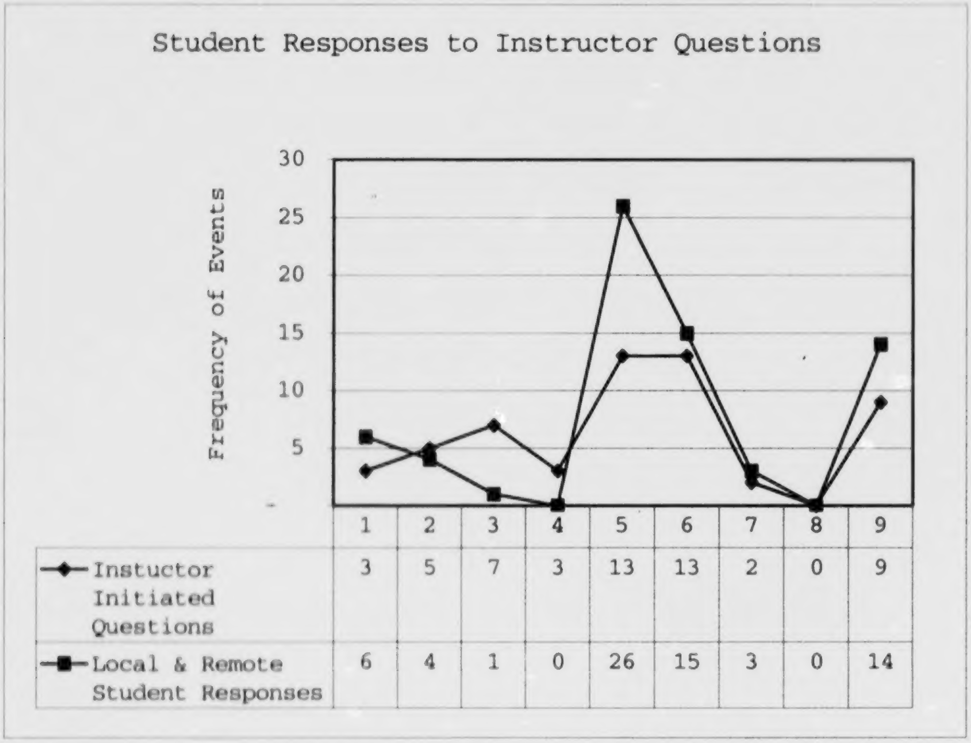
Note: Percentages are calculated by column to represent the percent of the event type.

A total of 55 instructor initiated-to-student questions intended to solicit a response, as displayed in Table 4, resulted in a total of 67 student responses-to-instructor, which included the student responses for "local", "remote", and the "entire class" columns in

Table 5. A larger number of responses than questions occurred because more than one student responded to some questions. Seventy-five percent of the responses were from the local site and only 24% were from the remote site. This represents the frequency that would be expected if evenly distributed among those in attendance, 24 local, four students at the remote site, and the mediator.

When comparing the student responses to questions solicited by the instructor during each of the nine observations, a pattern emerged (see Figure 6). An increase in the number of student responses coincided with an increase in the number of instructor questions. After reviewing the nature of the events, it was found that the increased number of events in Observation 5 was most likely the result of discussions during a book review instead of the usual lecturing of other observations.

During the book review discussion, the instructor's focus on the students was more intense with greater eye contact and engaging dialog. He posed questions to provoke the students to think about the content that was being discussed.



	1	2	3	4	5	6	7	8	9
◆ Instuctor Initiated Questions	3	5	7	3	13	13	2	0	9
■ Local & Remote Student Responses	6	4	1	0	26	15	3	0	14

Figure 6. Frequency line graph of student responses to instructor questions.

For example, when the instructor asked, "What were the attitudes of the people in the book about the gypsies in Romania and how did that play into Hitler's attempt to exterminate them like the Jews?" The students responded by flipping through the pages of their book. One student responded by asking "What page are you on?" Another student tried answering the question. In interview, the instructor referred to this type of questioning as "thought provoking" because the student had to synthesize and draw conclusions rather than simply looking up an answer. The increased number of events in Observations 6 and 9 occurred as a result of discussion concerning the content of pending examinations.

Camera Events. Each site contained three cameras: (a) one focused on the instructor, (b) one that panned the classroom, and (c) a stationary camera to display documents. There were two television monitors at the front and rear corners of the classrooms. The monitor on the left side usually displayed a close-up view of the instructor, items placed under the document camera, or a wide angle view of the students at the local site while the other monitor on the right side showed the students at the remote site. The student cameras usually provided a wide-angle view of the classroom but could zoom in on individual students for close-ups. The motorized cameras were manually adjusted and switched by the instructor, mediator, or student presenter at a console in the front of each classroom. The instructor wore a lavalier microphone clipped on their collar and students spoke into nearby microphones on top of the desks (see Appendix A for a diagram of the classroom facility).

Camera events were divided into two groups, document-camera and other-camera. The document camera allows the presenter, usually the instructor, to place materials under a camera mounted on the lecture desk at the front of each classroom. The material may then be viewed on the television monitor screen for the students to view at both the local and remote sites. It can be used as a chalkboard to write messages or to draw focus to specific information by pointing. Each time the document camera was used, an event was recorded and often a comment was included to describe the activity or nature of the event. The following example is a segment of comments that were recorded as document-camera events:

> picture of Ivo Andre book,
> picture of Yugoslavia including armored positions,
> using pencil to point; wrote the name on blank,
> back to picture of book,
> back to map,
> book on Balkan Ghosts,
> flipping pages of book on screen,
> shows picture from book of woman and zooms in
> showing syllabus,
> National Geographic map moves across screen,
> pointing to locations on the map,
> spells word writing on sheet of paper under camera,
> writes another word after pointing to map,
> repositions map to Hungary,
> handwriting is possible to read but very thin line,
> flipping maps under the camera somewhat
> distracting,

using pen to indicate locations and zooms in,
refers to map and spells word on sheet of paper,
pointing to locations with pen,
referring again to the map and spelling more words.

The other-camera events represented comments concerning activities of the cameras other than the document camera. The following example is a segment of comments that were recorded as other-camera events:

changes to instructor for 5 seconds,
switched to instructor,
zooms camera to map hanging behind desk,
only the instructor's arm appears as he points,
zooms out to include instructor and the map,
using his pen to point to locations on map,
only 4 of 5 students are visible at remote site,
view of instructor,
switched view to mediator at remote site,
viewing side of screen with map on the right,
only 3 of 4 students at the remote site are looking at the television monitor screen,
back to view of instructor,
mediator changes to his view,
mediator switched to the instructor view,
difficult to see students at the local site at back of room,
can't tell who is speaking at local site,
while local student responds to question the mediator is switching back and forth between view of instructor and student,
instructor switched to himself then the mediator switched to the students at the local site,
back to view of instructor and remote,
the head of a student is bobbing at the bottom of the instructor screen,
mediator finds view of local student speaking.

A total of 99 document-camera events occurred and 58 other-camera events occurred which included changes of views of the instructor, students, mediator, and specific comments concerning camera activity. Camera events declined during the observations over the course.

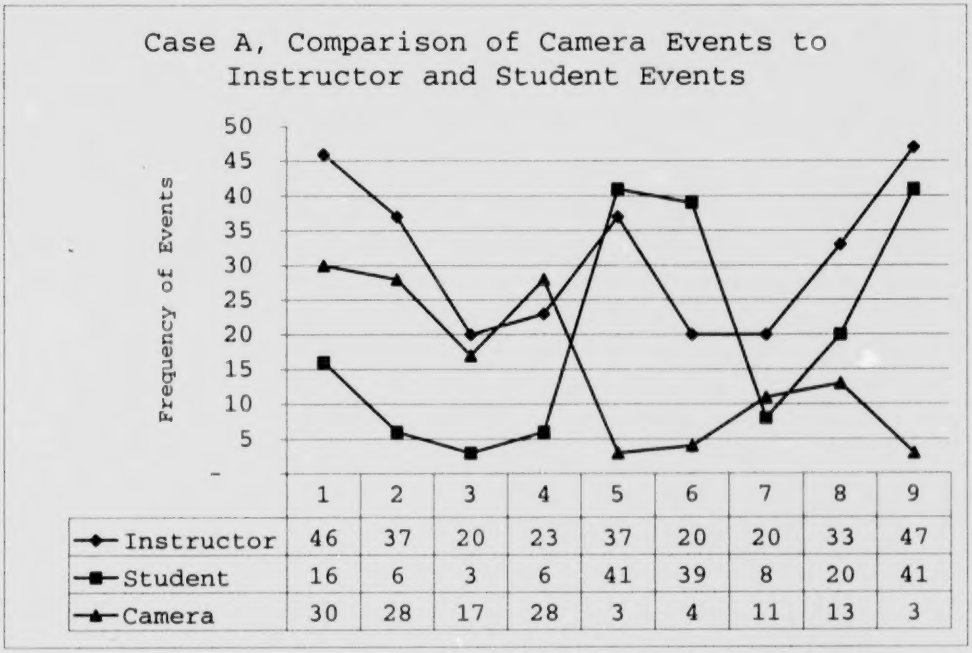
Table 6

Frequency of Camera Events for Case A.

Case A Observations	Frequency of Document-Camera Events	Frequency of Other-Camera Events
1	17	13
2	18	10
3	13	4
4	18	10
5	1	2
6	2	2
7	7	4
8	10	3
9	3	7

The lowest frequency of camera events occurred during Observations 5 and 6 when interactions were high (see Table 6). This may indicate that the instructor's focus on interacting with the students took precedence over making camera changes. Fewer references to maps and details under the document camera occurred and the instructor remained in camera view for extended periods. When continuing the lecture with the document camera view, the students became disoriented that created a camera lag until the view was changed to the instructor.

In later observations, the mediator assumed a more active role in manipulating the camera views for the instructor. This was especially noted during Observation 9 when the students asked the instructor about the content of their final exam.



	1	2	3	4	5	6	7	8	9
◆ Instructor	46	37	20	23	37	20	20	33	47
■ Student	16	6	3	6	41	39	8	20	41
▲ Camera	30	28	17	28	3	4	11	13	3

Figure 7. Frequency line graph comparing camera events to instructor and student events for Case A Observations 1-9.

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With the exception of the students at the remote site who were on camera throughout the observations, the camera view was predominately of the instructor interspersed with views from the document camera and camera views of selected students at the local site when they responded to instructor questions. When comparing camera events to the instructor and student events during each of the nine observations, there was a sudden drop in camera events during an increase in instructor and student events (see Figure 7). This could be attributed to a greater concentration of the instructor on interacting with the students since the drop occurred during discussions for a book review in Observation 5 and preparation for a pending examination in Observation 6.

Mediator Events. The Observation Protocol Software did not include categories for specifically coding the mediator or facilitator behaviors. However, the researcher recorded field notes describing the actions and verbalizations of the mediator. In the context of this study, "Mediator Events" refers to the field notes related to the mediator activities and are analyzed as a subset of all other events. A facilitator merely provides technical support, whereas, the term "mediator" refers to role of an instructor's assistant. Using on-site facilitators or mediators who develop a personal rapport with students and who are familiar with equipment and other course materials increases student satisfaction with courses (Burge & Howard, 1990).

A mediator was only used in Case A and remained at the remote site. At the mediator's request, the instructor granted him permission to attend the class as a volunteer and did not provide any explicit instructions to the mediator for the class. This was the first interactive videoconferencing experience for the mediator. He said this would help prepare him for teaching a similar class using the interactive videoconferencing system in the near future.

Initially, the role of the mediator was limited to that of a passive observer and facilities manager who opened and closed the classroom, turned on and off the videoconferencing system, and called roll for the remote site at the start of each class. As the course progressed, the mediator took a more active role in changing the camera views for the instructor, repositioning the camera for views of the students, and student mentoring.

In an interview, the mediator indicated a personal interest in attending the class because of the reputation of the instructor. In addition, he wanted a "first-hand experience" to become more familiar with the videoconferencing technology for courses that he might teach in the near future.

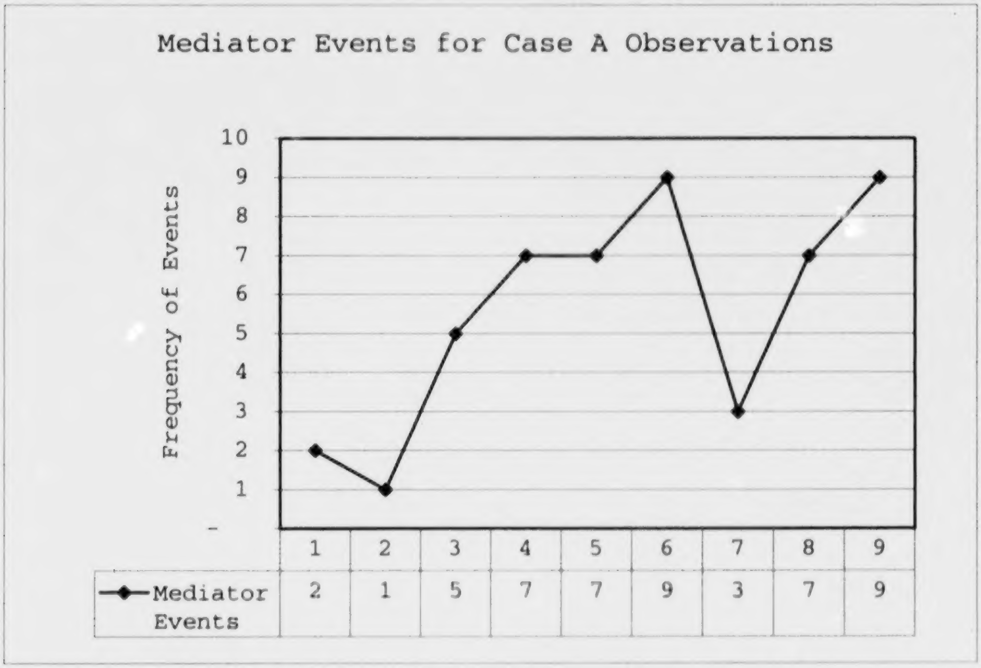


Figure 8. Mediator events occurring during Case A observations.

The mediator sat facing the students at the instructor's console desk in the front of the classroom at the remote site. Through the console, he had access to the same camera controls as the instructor at the local site. He wore a microphone similar to the instructor's that was usually left on during the entire class, unlike the students' that were usually off until switched on by the student when speaking. Fifty mediator events were recorded during all nine observations ranging from camera movements to responding to questions and initiating questions to the instructor. As the course progressed, the participation level and interactions of the mediator increased, except in Observation 7, when student and instructor interactions were also low (see Figure 8).

The nature of the mediator participation also changed. Occasionally, the instructor solicited the opinions and comments of the mediator concerning current events and book review discussions. Without using the microphone to avoid interrupting the local site, the mediator discussed questions from the instructor and responses from the students at the local site with the students at the remote site. Because the mediator was also a professor of history, he tried to clarify points of discussion without posing any challenges to the instructor's comments. The remote site became a class within a class. At times the mediator became a surrogate teacher or mentor to the students at the remote site. Occasionally the instructor asked the mediator if the students at the remote site had any questions rather than soliciting a response directly from the students at the remote site. "Camera events" where the mediator switched camera views between the instructor, students, and document cameras, represented a majority (60%) of the mediator events (see Table 7).

Table 7

Frequency of Mediator Events by Type for Case A.

Type of Mediator Event	Frequency of Events	
Camera events	30	60%
Instructor-to-mediator	7	14%
Mediator-to-instructor	7	14%
Other events	6	12%

Also, derived from field notes, an additional 28% occurred as questions and responses with the instructor. "Other events" included field notes concerning a distorted sound, reminders to the students to press the microphone switch, a disapproving facial expression to a student's comment, and two unrelated comments.

In interviews, it became apparent that the instructor and mediator had discussed the student interactions at the remote site. According to the instructor, the mediator commented that although the students at the remote site did not always enter discussion with the students at the local site, they were engaged in discussion with each other at the remote site. However, few student-to-student interactions at the remote site were recorded by the researcher during observations.

The mediator led some discussions with the students at the remote site while other discussions occurred at the local site. When asked if he thought that sort of activity detracted from the students at the remote site participating with the students at the local site, the mediator replied, "Yes!" He felt that his presence inhibited the students from responding. For that reason, the mediator said that he would not use a mediator at the remote site in his classes. However, the students at the remote site did not share that perception. The instructor perceived an advantage to having the mediator help manage the camera work, especially a mediator who knew the subject matter and was familiar with current events. The instructor could "bounce things off" the mediator, as another expert, for his comments. In the instructor's words:

> "[Without the mediator], I'd have to think more about the camera. When he started to do that, I thought, man this is a great relief cause I don't have to worry about that [adjusting the camera view]. Another thing I liked about somebody like Jeff up there, is [someone] who knows the subject matter reasonably well. He may not be as familiar with the history but he's very familiar with current events. Someone you could sort of bounce things off."

Categorical Analysis

This section includes an analysis of the textual data derived from observations and interviews. It provides details concerning the nature of the events and captures the essence of the experience as interpreted by the researcher, instructor, selected students, and mediator. Using the interaction model described by Moore (1989) and later appended by Hillman et al. (1994), the events are grouped into the following categories: (a) Learner-content, (b) Learner-instructor, (c) Learner-learner, and (d) Learner-interface. These categories provide a framework for classifying interactions that occur in distance learning environments (Moore, 1989). Interviews were conducted using pre-constructed questions in a guided, open-ended format. Nine students at the local site were interviewed between observations for approximately 10 minutes; six by telephone and three in person. Four students were interviewed at the remote site as a group following the observation periods (2, 5, and 7). For analysis, the interview data were grouped by similarity into 13 local site and 30 remote site responses. Two separate, 30-minute interviews, which resulted in responses to 82 questions, were conducted with the instructor.

Many of the students were unaware of the impact of their interactions on each other. When asked how their interactions would affect other students' interactions, students at the local site said, "just like any other class." The students at the remote site considered the mediator "useful" before and after class but preferred the instructor. They considered the mediator's affect as small.

Learner-Content. At the first class meeting, students were given a syllabus that described clear and concise details of the content to be presented and discussed at each meeting. Students were assigned five books to read during the course of the semester, portraying events, locations, and individuals. They were informed in their class syllabus that their participation in class discussions during the review of the outside readings would be part of the grade; however, the method of recording the participation was not described.

During the lectures, content was presented in chronological order with specific maps and materials. Students viewed archive film segments depicting the actual events that were discussed in class and described in their reading assignments. The instructor used the maps and films to provide scaffolding for the students. When asked which classroom activity did they find most beneficial, only students at the local site said lecture whereas, both local and students at the remote site said, "the document camera view of the maps was most helpful." The map information was also described verbally. One remote student said, "the maps were visually appealing but not always informative [or necessary]." Some students preferred the instructor's use of the document camera rather than a chalkboard to spell names and places and to organize dates into a chronologically ordered vertical list with repeated underlining and circling specific items for emphasis. They said, "The text was easier to read when the instructor zoomed in for a close-up view of the information" and "It was easier to follow [the instructor]." When asked about the use of the document camera to spell information and highlight dates, the instructor remarked:

> "Spelling words and organizing dates provides more time for the students to write it down and for me to joke about it. This makes the information special so they might remember it better. I spell it out for them orally. Make jokes about how I can't spell some of them and how they can be spelled in a variety of ways. It gives the student a chance to write it. I remember one professor in particular, when I was an undergraduate, that would put everything on the board in the beginning, you know, all the names he was going to use and you had to find them. He would mention the names in the lecture and you had to search the board for the right spelling. It was convenient for him but not for the students. That's when I decided that I was going spell the name out as I said it. Also, I don't tell students in the advanced classes because they ought to know better, but I tell the freshmen that if I put it on the board, it's fair game for the test. They should underline it. If I write it down it's important enough to be on the test."

The instructional content of the class coincided with several current world events in Bosnia. United States officials were debating their involvement in resolving the conflicts in Bosnia. Discussion of historically long-seated animosities toward the Serbs frequently appeared in the news. The instructor used the current events from local and foreign newspapers to begin each class meeting, which brought real-life drama and relevance to the subject matter. The instructor presented the content with humor and as anecdotal or storytelling that gave the impression he had personally witnessed the events. Occasionally, if no questions were asked, the instructor would "tell an anecdote or story to give the students a break from note taking and a chance to formulate questions or ideas they might want to express." Following statements, the instructor often gave a characteristic laugh.

Learner-Instructor. The instructor was not only considered an expert in his field but also an accomplished presenter capable of delivering an informative and interesting lecture. Interviews of the mediator and students revealed that some took the course partly because of the instructor's reputation. One student commented "I knew the reputation of the instructor from a previous seminar" and another said, "the class was recommended by the mediator who knew the instructor." The instructor addressed the entire class periodically by prompting "Ok, any questions?"

Occasionally, the instructor followed the first prompt for any questions with a second attempt directed at the remote site, looking not into the camera, but at the television monitor view of the students at the remote site. In interviews, the instructor commented:

> "I tried to prompt them and didn't have much luck, the only other one [alternative] is to call on them [individually]. I hated that. I do that if I'm in a seminar but in this kind of format I don't like to do that. Even in the discussion of the books I don't like to do that in fear if someone hasn't read it they'll be embarrassed. But in seminars, like a graduate class where they are expected to do the work on a weekly basis, I do that in my seminars."

Even with the more direct approach, it seldom resulted in a student response. When students at the remote site were asked about this specific instructional technique, several said that it was not necessary for the instructor to pause for questions. Frequently, the students at the local site responded before the students at the remote site. In interviews, students at the remote site indicated that they sometimes waited to see what the students at the local site asked. If the question was addressed by the students at the local site, no response from them was necessary. At one point, after the instructor asked a question, there were five seconds of silence before a student at the remote site responded with an answer.

In an effort to increase learner-instructor interactions through awareness of the learner's interest and experiences, the instructor required the students to submit reports that compared course content to the learner's personal experiences. When asked how his approach to teaching had changed, he responded:

> "I realized I wasn't giving enough assignments and that because I had four students [at the remote site], I was never going to know them like the students in the classroom. They [the students at the remote site] would hang around after class and chit-chat but I couldn't see them on the screen. There wouldn't be the face to face contact that you usually get and so you need to be more engaged with the students than just two examinations. I decided to have the students write papers or reviews on the books they were reading -- not book reports. Take something out of the book that you find interesting and relate it to your own experiences. I've been real happy with that approach. It's another way to get to know the students and their abilities. You learn something about them and their writing style and their interest and experiences. It tells you more about the students themselves. I had never assigned a paper [before teaching distance learning classes]. That's what got me started and I'm really happy with the results."

In Observation 1, the first class meeting, the instructor gave the students a five-minute introduction to the videoconferencing technology but not to each other. A map was taped to the wall behind him but was seldom used. Instead, he often referred to map information that was placed under the document camera. He distributed a syllabus as the students entered the local classroom. The syllabus was distributed by the mediator at the remote classroom. Although, the students at the remote site could be viewed on a television monitor throughout the observation period, the mediator was never introduced or shown on camera while the instructor reviewed his camera techniques for switching and zooming.

Before Observation 2, approximately 10 minutes of informal discussion activities occurred between the students and the instructor at the local classroom. This activity was not observed again until Observation 6 when students had questions concerning mid-term examinations and Observations 8 and 9 nearing final examinations. The before class discussion included humorous stories told by the instructor, assignment topics, and current events. Most socializing occurred between the instructor and students rather than between students in the local classroom. The students at the remote site could hear the instructor but were engaged in their own conversations at the remote classroom. As conversation ended at the local site, students at the remote site could be heard at the local site. As the instructor began his lecture, the mediator could be heard discussing other classes that were offered at the remote site with the students. The instructor interrupted the conversation by saying, "What's going on up there?" When students were asked to describe how their interactions with the instructor were different from a traditional classroom, the students at the remote site responded, "We felt left out of the discussions [that occurred before and after class]."

During the book review discussion in Observation 5, the instructor called upon one of the students to give personal testimony of the attitudes and perceptions in Romania where he lived before coming to the United States. Although his comments lacked the instructor's vast historical perspective, involving the student's views seemed to create a personal connection to the events for others in the class as evidenced by an exchange of interactions following the student's personal views.

During the first half of the class, before the student's opinions were solicited, there were only six student-initiated-to-instructor interactions. During the second half of the class following the student's views, 21 student-initiated-to-instructor events occurred. Almost all of the interactions occurred at the local site involving eight different students. Only three interactions were initiated from the remote site students during the second half of the class.

Before class began in Observation 8, students at the local site were given a class evaluation form. Initially, the students at the remote site did not participate in completing the form until the instructor was reminded that the students at the remote site could be included by faxing the form to the remote site. During informal discussion at the instructor's desk before Observation 9, several students at the local site referred to a local student negatively because of his frequent questions and comments. When interviewing the instructor about leaving the microphones on all the time rather than pressing an on/off switch, he referred to the local student (anonymously referred to here as, Johnny) with the following comments:

> "I'm not sure if the students from the remote site could pick out who was speaking, unless it was one of those people right in the center, you couldn't

> tell. [Johnny], who always talked about everything, sat in the back. They [the students] knew who he was. One of them said, 'he could teach the course himself.' His [Johnny's] interactions were quite high. You had about five [local] students that did 98% of it [verbal interactions]."

Interviews with the students at the remote site corroborated the instructors comments by acknowledging, "we all knew who [Johnny] was by name." This suggests that there may be a limit to the number of interactions allowed each student by the group as a whole, even when participation is part of the grade.

After class ended for Observation 1, all comments to the remote site were relayed through the mediator who was at the front of the remote classroom but out of camera view. As the mediator said, "Goodbye!", a group of approximately 10 students approached the instructor's desk at the local classroom to ask questions about the course content and enrollments. One student indicated an interest in the videoconferencing technology. The instructor prompted the students at the remote site, "Any Questions?" but no response occurred.

A facilitator at the local site reminded the instructor to change camera views at the remote site but the instructor did not understand what he was saying.

The facilitator then reminded the instructor to switch to himself after viewing documents. The instructor replied, "Yeah, I noticed that."

Usually, after class was dismissed the students at the remote site could be seen leaving immediately. The instructor said, "The students at the remote site probably had classes to get to" but that did not seem to deter the students at the local site from hanging around after class, sometimes with two or more students for more than 15 minutes. In addition, the researcher conducted interviews with the students at the remote site after class was dismissed. After most classes, the mediator assumed responsibility to turn off the videoconferencing system at the end of class when a facilitator was not present.

From the remote site, learner-instructor discussions at the local site sounded like people talking at a distance across a large room. On a few occasions, discussions at both the local and remote sites continued after the system was turned off removing the chance of further interactions. After class was dismissed for Observation 9, students at the local site formed study groups to prepare for the final examination. No discussion or indication of study groups occurred at the remote site.

Learner-Learner. Very few interactions occurred between the learners. Most verbal interactions were directed toward the instructor. During Observation 9, only one interaction was recorded. It lasted approximately 15 seconds and referred to preparation for the final examination.

The seating position of the students at the local site was recorded with the events during observations at the local site to examine spatial arrangement of the students and to determine if proximity to the instructor or television monitors was a factor. However, no specific pattern emerged from the data.

Learner-Interface. In the syllabus that was given students at the first class meeting, the instructor informed the students of the "interactive video" aspect of the class and warned them that "since this technology was new to both campuses, there may be some bugs and problems that they would have to work out." In interview, the instructor described the difficulties in preparing materials for use in distance learning classes:

> "I've got a student worker who has been digitizing slides for me. I want to use the system and exploit it more than I did last time. This will take a lot of preparation. I went over there and talked to a facilitator and he showed me what digitizing the slides would entail. I think it will enhance a lot of it. It also showed me that I didn't have the talent to do it well myself and didn't have the time. He told me that if I had a student worker who was majoring in design who was interested in computer tech and its application to design, that's the kind of person you want. Don't get a computer science major, or a civil engineer. Don't get someone who knows computers. Get someone who knows art. We found one, and after begging my secretary, we turned over this project to him. He's learning a lot. We'll put the information on a CD-ROM disk, stick it in the computer in the videoconference room and see what happens. What I'd like to do next time is to use the Elmo [document camera] a little bit better. That's why I want to try this World War I class. I think pictures would have helped a lot -- talking about Stombaliski to show what he looked like. The films of the Balkans not so much [but] in W.W.I, the films are very effective. I'd like to use more of the visual [capability] of the [videoconferencing] classroom. I want to see how this digitized stuff works and if I can handle it. Because, one of the things about the W.W.I class, is I have to call up the same slide more often. When you have a slide and you have a carousel and you're standing there clicking away trying to find where he was -- you go from maps to people, and I want to see if I can do that. Now what worries me, of course, is that I'll get enamoured with the gadgets and the lectures won't be as good."

The effect of the technology interface became apparent while observing instructor and student behaviors during several of the observation periods. At the start of Observation 3, the students at the remote site took notes almost continuously as they viewed a television monitor at a high angle in the front left corner of the room. With very few camera changes occurring, visual fatigue developed after 30 minutes of class time, when one student yawned, and then another, while still another sat with his arms crossed. When asked, "What single factor would improve the class?" Students at the remote site responded, "camera switching [back to the instructor] after viewing documents and the lecture continued." Students at both the local and the remote sites perceived no problems taking notes and remarked that note taking seemed enhanced by the use of the document camera. It was easier to read and follow the instructor.

The instructor experienced difficulty in discerning visual cues and body language of the learners. The instructor's visual perception of the learner is considerably handicapped in the distance learning environment as indicated by his comments:

> "The resolution of the TV sets was not sharp enough to catch expressions on faces. One of the most important things in a classroom is to read the eyes and you can't [on the TV monitors]. That is very important. That was the biggest disappointment. I didn't know if they were reacting to anything. I couldn't tell if they were surprised or puzzled or

> what. I tried a little harder to get some response. If I said something that should get a little response, instead of looking at my own [local] students I would look at the monitor."

The students at the remote site said they were continually "frustrated" when the students at the local site forgot to use their microphone when they would speak. The instructor frequently asked the students at the local site to repeat what was said into their microphone. Both local and students at the remote site said they were "less likely to follow-up on questions because of the microphone." After several failed attempts, the instructor rarely directed the camera toward the student speaking because of the awkwardness of using the controls.

Most camera changes occurred between the instructor and the document camera. A large map was hung on the wall behind the instructor, but was seldom used. Instead, the instructor placed maps under the document camera that were specific to his topic and highlighted several locations by pointing with his finger, pencil, or pen. The instructor remarked about how effective this technique was and indicated how this capability had changed his approach to teaching the course. In the absence of a chalkboard, the instructor wrote on a sheet of paper under the document camera to highlight and organize dates, and to spell names and places.

In interviews, the instructor made several comments concerning what he considered as perceptions and expectations of the learners:

> "In my experience with freshmen, you have to use a very traditional kind of instruction because their perceptions are different. They are not there for the learning experience. They are there because it's required. They have not made the transition to the university environment. What I mean, is that they regard almost any kind of supplemental instruction to imply that the teacher doesn't want to teach. If you show a movie today, it's because the teacher is unprepared or doesn't want to teach today. It comes out of high school. By the time they are college seniors, they appreciate the integration of technology and are there because they want to be."

Further, the instructor described limitations he considered appropriate for the distance learning environment based on the attitudes of the learners:

> "I want to develop a class that will employ a lot of technology but I have to find a way to control the enrollment. Right now the easiest way to control it is to teach it at 7:30 in the morning. I usually teach at 8:30 in the morning but there is a big difference between 7:30 and 8:30 [students]. I figure, if I teach it at 7:30, I could probably limit it to 50. You do a lot of things different with 50 students than with 150. You get a lot of non-traditional students at 7:30. Many go to class and then to work or from work. You get a mix of students that are more appreciative and more

> interested in learning than typical freshmen. It's the kind of student you're looking for -- more focused. I would be more comfortable using that kind of [electronic presentation] technology in a class that was focused and really appreciated it. Using it to teach freshmen would be a disaster."

Although the instructor was aware of the difficulties in getting the students to respond from a remote site, his comments illustrate the effort and frustration of his distance learning experience. When asked about his expectations of the students concerning distance learning, he remarked:

> "First, would the students at the distance site participate in the discussions, as would the students at the local site? They didn't! Secondly, would I be able to draw those at the distance site into the conversation effectively? I couldn't, but I would like to try that again. I thought I would be able to [but] as the class went on, the little participation I got [from the students at the remote site] died out!"

In contradiction of the data, which indicates a more favorable response from the students, his comments may reflect more upon his own expectations.

Analysis of Case B

The following analysis is divided into two sections, Observation Protocol Analysis and Categorical Analysis. The first section presents data collected during the observations which is arranged according to the protocols as prescribed in the adapted version of Flanders's Interaction Analysis. The analysis is arranged into four subsections: (a) Instructor events, (b) Student events, (c) Presenter events, and (d) Camera events. The presenter events recorded activity when the student made their presentations. Data collected during the student presentations were unique to Case B.

The Categorical Analysis section provides an analysis of the textual data obtained from field notes, comments entered in the OPS, and interviews. It provides details concerning the nature of the events and represents the patterns and essence of the experience as interpreted by the researcher, instructor, and selected students.

Observation Protocol Analysis

Four observations were conducted beginning in January from the remote site followed by a local site observation and then two remote site observations ending in April. Additional local observations were planned but sudden cancellation of the classes due to weather, equipment failures, and rescheduling of examinations prevented them. Although there were fewer observations than in Case A, the duration of each observation was longer for approximately one hour and 20 minutes during the evenings between 4:40 p.m. and 6:00 p.m. The local site observation included one hour and 27 minutes of observations and the remote site included three hours and 47 minutes, in which two hours and 20 minutes were student presentations, for a total observation time of five hours and 14 minutes with 378 events.

Seventeen students attended the local site and five students attended the remote site. Field notes, including 51 separate comments that described activities observed before (24), during a break (10), and after (41) the class observation periods, are described in more detail in the following sections.

During Observations 1 and 2, the instructional approach was mostly lecture with occasional discussion and Observations 3 and 4 were primarily student presentations. The instructor lectures included computer graphics and document camera visuals. Characteristics of the student presentations varied dramatically from the instructor presentations in method, quality of presentation, and content.

Instructor Events. The instructor events represent the interactions initiated by the instructor toward the students during Observations 1 and 2. Most of the instructor events (81%) were directed toward all of the students.

A total of 128 instructor-to-entire-class events occurred. As predicted by previous research (Moore, 1989), a higher incidence of instructor-to-local-students events (21) occurred than did the instructor-to-remote-students events (10) (see Table 8).

Table 8

Comparison of Instructor to Local, Remote, and Student Events for Case B.

Target	Frequency	Count
Instructor-to-entire-class	128	81%
Instructor-to-local-students	21	13%
Instructor-to-remote-students	10	6%

Most instructor-to-local-students and instructor-to-remote-students events occurred in Observation 2 with only two remote events in Observation 1. All events occurred between the instructor and students with the exception of one event that occurred between two students at the local site and another between a remote student and a local student.

Table 9

Frequency of Instructor-to-Student Events by Type for Case B.

Type of Event	Frequency of Event					
	Local		Remote		Entire Class	
(a) Accepts and clarifies	5	24%	1	6%	4	3%
(b) Praises or encourages	3	14%	2	12%	5	3%
(c) Acceptance of ideas	5	24%	4	25%	4	3%
(d) Asks questions to solicit a response	2	9%	2	13%	69	44%
(e) Lecturing content	1	5%	0	0	64	41%
(f) Giving directions	4	19%	3	19%	7	4%
(g) Criticizing	1	5%	4	25%	3	2%
Totals	21		16		156	

Note: Percentages are calculated by column to represent the percent of the event type.

As defined by the observation protocols, the instructor events were categorized by seven types: (a) Accepts and clarifies, (b) Praises or encourages, (c) Acceptance of ideas, (d) Ask questions to solicit a response, (e) Lecturing, (f) Giving directions, and (g) Criticizing. More than 85% of the instructor-to-student events were the result of lecturing and asking questions. Three events were critical of the class when they failed to respond to her lecture. Other criticism occurred when the instructor interrupted the class to reprimanded a student as he attempted to clarify a point during her presentation by responding negatively toward another student at the remote site (see Table 9).

Student Events. The student events data includes observations of all student events other than those that occurred during the student presentations. The student events were categorized by four types: (a) Response-to-instructor, (b) Response-to-student, (c) Initiated-to-instructor, and (d) Initiated-to-student (see Table 10). Of the 102 student events that occurred during the instructor led observations, 74% were directed toward students at the local site, 15% toward students at the remote site, and 11% toward the entire class.

Most of the student events at the local site (64%) were responses to instructor questions. During Observations 1 and 2, which were instructor led, 69 instructor questions solicited 48 responses (75%) from the students at the local site and only six responses (9%) from students at the remote site. When compared to the number of students at each site, 17 local and five remote, the number of remote events is lower than expected for an equal distribution among the two sites.

Table 10

Frequency of Student Events by Type for Case B.

Type of Event	Frequency of Event					
	Local		Remote		Entire Class	
(a) Response-to-instructor	48	64%	6	38%	10	91%
(b) Response-to-student	1	1%	1	6%	0	0
(c) Initiated-to-instructor	26	34%	8	50%	1	9%
(d) Initiated-to-student	1	1%	1	6%	0	0
Totals	75		16		11	

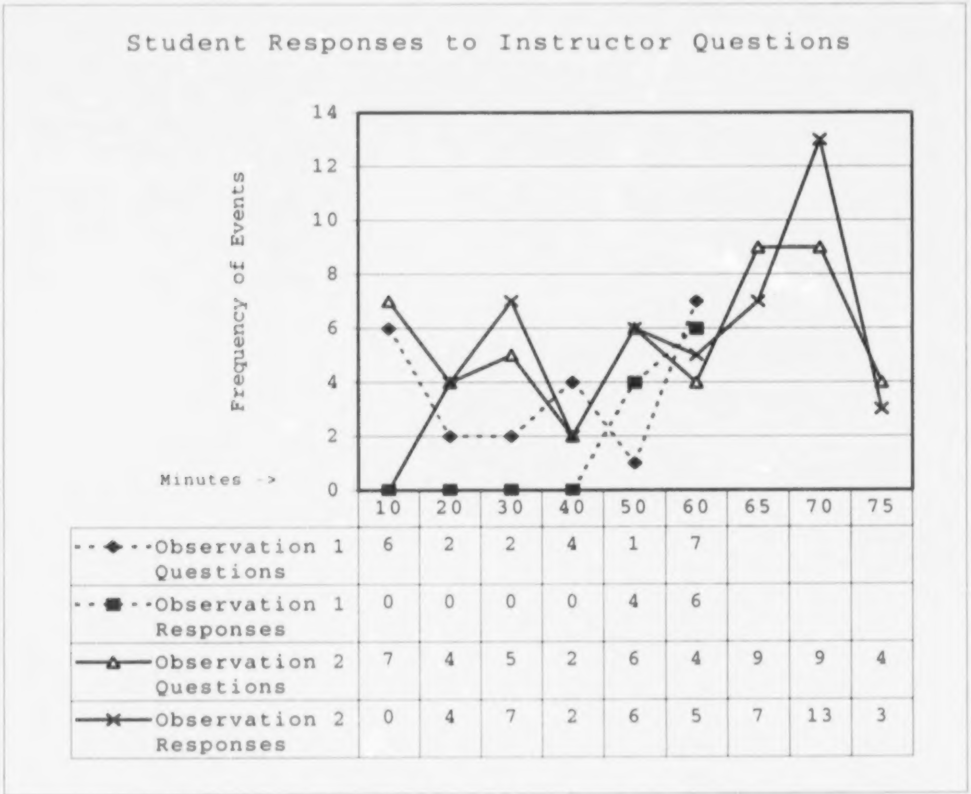
Note: Percentages are calculated by column to represent the percent of the event type. This table does not include student presentation events.

Only four events were recorded between students during the lectures and discussions led by the instructor. They occurred when a student disagreed with the comments of another student. The following field notes describe the interactions:

> "Speaking to the students at the remote site as she looked at the television monitor behind her, the instructor remarked, "Why don't you people respond?" Two students at the remote site replied with an answer. Disagreeing with their answer, a local student responded to the students at the

> remote site. A minute later, a student at the remote site asked a student at the local site to repeat what they had said with the microphone switched on."

Student-to-student interactions were also observed informally when the instructor prompted students to work cooperatively in determining schedules and topics for their student presentations. During Observations 1 and 2, an increase in student responses to instructor questions occurred (see Figure 9).



	10	20	30	40	50	60	65	70	75
- - ◆ - - Observation 1 Questions	6	2	2	4	1	7			
- - ■ - - Observation 1 Responses	0	0	0	0	4	6			
—△— Observation 2 Questions	7	4	5	2	6	4	9	9	4
—✕— Observation 2 Responses	0	4	7	2	6	5	7	13	3

Figure 9. Line graph of time sliced intervals of student responses to instructor questions during instructor led Observations 1 and 2 of Case B.

In reviewing the nature of the events, it was found that students at both local and remote sites were unresponsive even after the instructor prompted, "Are there any questions?" followed by a critical voice, "Why don't you people respond?" Although the students at the remote site responded briefly, this condition persisted until the instructor structured specific questions about the content (e.g. "What is the scientific method?" and "What are social roles?"). When the students responded to the questions, the instructor followed up with more questions like how, what, why, and "There are no wrong answers." The instructor requested a show of hands to another question and engaged students in a discussion of issues concerning cultural and ethnic diversity followed by stories about her personal experiences while visiting Africa. Still, some students responded with a simple nod of their head or by saying "Uh huh."

Presenter Events. As indicated in an interview by the instructor, the student presentations were considered an integral part of the instructional approach. During Observations 3 and 4, three students, two from the local site and one from the remote site, made presentations to the class for approximately 40 minutes each. For separate analysis, the student presentation events were extracted and categorized by six types: (a) Local-presenter-to-students, (b) Student-response-to-local-presenter, (c) Student-initiated-to-local-presenter, (d) Remote-presenter-to-students, and (e) Student-response-to-remote-presenter (see Table 11).

Table 11

Frequency of Presenter Events by Type During Observations 3 and 4 for Case B.

Type of Event	Frequency of Event					
	Local		Remote		Entire Class	
(a) Local-presenter-to-students	3	33%	6	43%	20	71%
(b) Student-response-to-local-presenter	2	22%	2	14%	0	0
(c) Student-initiated-to-local-presenter	3	33%	6	43%	0	0
(d) Remote-presenter-to-students	1	11%	0	0	8	29%
(e) Student-response-to-remote-presenter	0	0%	0	0%	0	0
(f) Student-initiated-to-remote-presenter	0	0%	0	0	0	0%
Totals	0		14		28	

Note: Percentages are calculated by column to represent the percent of the event type.

Most presenter events were directed toward the entire class. The presenters asked very few questions and received even fewer responses. The two students at the local site were ineffective in using the document camera and switching camera views during their presentations. Although the presenter at the remote site was more effective in using the document camera and switching views, her instructional mode consisted of lecture without pauses or questions to evoke responses from the other students. This resulted in no responses or initiated questions from the students at the remote site.

Camera Events. Each site contained three cameras: (a) one focused on the instructor, (b) one that panned the classroom, and (c) a stationary camera to display documents. There were two television monitors at the front and rear corners of the classrooms. The monitor on the left side usually displayed a close-up view of the instructor, items placed under the document camera, a computer presentation display, or a wide angle view of the students at the local site while the other monitor on the right side showed the students at the remote site. The student cameras usually provided a wide-angle view of the classroom but could zoom in on individual students for close-ups. The motorized cameras were manually adjusted and switched by the instructor, mediator, or student presenter at a console in the front of each classroom. The instructor wore a lavalier microphone clipped on her collar and students spoke into nearby microphones on top of the desks (see Appendix A for a diagram of the classroom facility).

Camera events were divided into two groups, document camera and other camera. The document camera allows the presenter, usually the instructor, to place materials under a camera mounted on a stand near on the lecture desk at the front of each classroom. The material may then be viewed on the television monitor screen for the students to view at both the local and remote sites. It can be used as a chalkboard to write messages or to draw focus to specific information by pointing.

Each time the document camera was used, an event was recorded and often a comment was included to describe the activity or nature of the event. The following example is a segment of comments that were recorded as document-camera events:

close up of a syllabus but can't be read on screen,
the typewritten page is illegible,
switched to document,
does not point or highlight document items,
now pointing to items on the document,
illegible typewritten page.

The other-camera events represent comments concerning activities of the cameras other than the document camera. The following example is a segment of comments that were recorded as other-camera events:

view of instructor and remote students,
view of instructor and remote students,
instructor demonstrates computer screen display,
camera is switched by the instructor to the other side of the local room,
view of instructor while remote student introduce himself,
instructor continues lecturing but not on screen for several minutes,
view of slides and remote site,
instructor has not been on screen for several minutes,
view of computer graphic and remote site,
continuing lecture with computer display on screen,
adjusts camera to show view of local students,
switches to instructor view,

Six document-camera events and 21 other-camera events occurred during the observations. Other-camera events included changes of views of the instructor, students, and specific comments concerning camera activity. The number of camera events declined during the observations over the course of the semester.

Table 12

Frequency of Camera Events for Case B.

Case A Observations	Frequency of Document-Camera Events	Frequency of Other-Camera Events
1	9	2
2	11	0
3	0	3
4	1	1

The smallest number of camera events was recorded during the student presentations in Observations 3 and 4. Observations 1 and 2 were lecturing by the instructor combined with discussion (see Table 12).

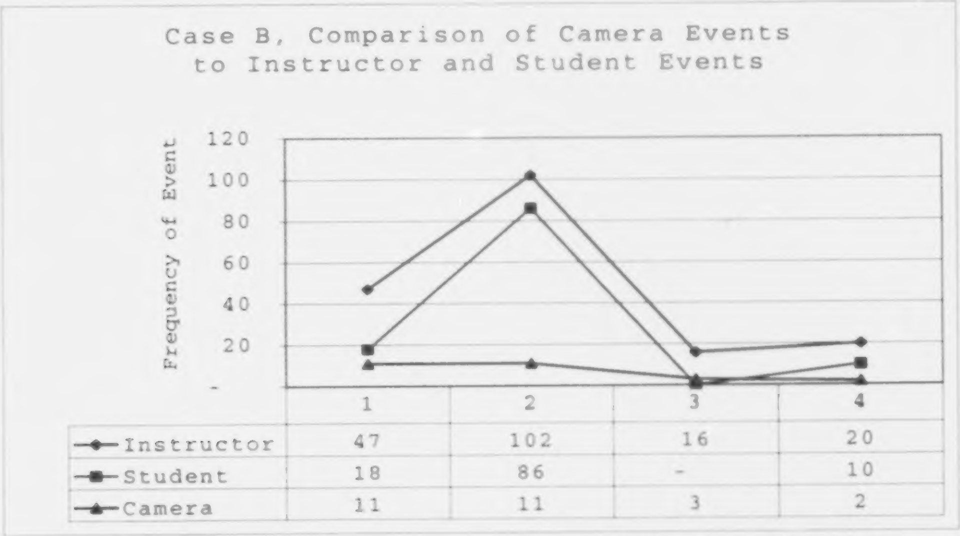


Figure 10. Cases A & B Line Graph of Observations by Type of Event.

Camera changes were infrequent providing a paucity of data for analysis. However, any relationship between camera events and the instructor or student events appears weak. A pattern did emerge to support a relationship between the instructor and student events during the observations (see Figure 10).

Categorical Analysis

This section includes an analysis of the textual data derived from observations and interviews. It provides details concerning the nature of the events and captures the essence of the experience as interpreted by the researcher, instructor, and selected students. Using the interaction model described by Moore (1989) and later appended by Hillman et al. (1994), the events are grouped into the following categories: (a) Learner-content, (b) Learner-instructor, (c) Learner-learner, and (d) Learner-interface. These categories provide a framework for classifying interactions that occur in distance learning environments (Moore, 1989).

Interviews were conducted using pre-constructed questions in a guided, open-ended format. Seven students at the local site were interviewed between observations for approximately 10 minutes, three by telephone and four in person. Five students were interviewed at the remote site as a group following the observation periods (1, 2, and 4). For analysis, the interview data were grouped by similarity into six local site and 20 remote site responses. Two separate, 30-minute interviews, which resulted in responses to 72 questions, were conducted with the instructor.

When asked how their interactions would affect other students' interactions, students at the local site said, "the remotes didn't say much." The students at the remote site considered the local site to have an advantage when interacting because of their proximity to the instructor; however, they acknowledged, "When one speaks at the remote site it encourages others at the remote site [to speak]."

Learner-Content. Course content included a textbook and material presented by the instructor during lectures and discussions. The syllabus described a grading scale and specific objectives to be achieved in the class. Course requirements included participation in the lectures, midterm and final examinations, and reports on two journal articles related to the course content.

In the syllabus, class discussion was emphasized as part of the grade during student presentations of the journal articles; however, no method of recording the participation was indicated. Students were assigned topics for 45-minute presentations to the class at scheduled times during the course. They were required to prepare innovative instructional media for an adult learning activity with documentation for instructions, objectives, target population, evaluation methods, and how the media was incorporated into the current learning environment.

Each student was required to research a topic, conduct a workshop, or develop a special project during the course. To guide the students in their studies, the instructor provided several pedagogical materials during the class including a History of Adult Education in America (Knowles, 1977), Principles of Effective Practice (Brookfield, 1988), and selected programming models. Critique forms were supplied for student peer evaluations of the presentations.

Learner-Instructor. During Observation 1, the instructor commented that the students seemed unusually quiet. In an effort to stimulate interaction during the lecture, the instructor said to the students at the local site, "You aren't much help with questions tonight; come on, wake up, and start talking" and then to the students at the remote site, "I don't hear any responses on the other end".

In Observation 2, the instructor turned away from the students at the local site to look up at the monitor behind the desk with a view of the students at the remote site and said, "Are there any questions?" followed by an authoritative voice, "Why don't you people respond?" Although the students at the remote site responded briefly, this condition persisted until the instructor became more effective in structuring specific questions about the content (e.g. "What is the scientific method?" and "What are social roles?"). When the students responded to the questions, the instructor followed up with more questions like how, what, why, and "There are no wrong answers."

The instructor requested a show of hands to another question and engaged students in a discussion of issues concerning cultural and ethnic diversity followed by stories about her personal experiences while visiting

Africa. Still, some students responded with a simple nod of their head or by saying "Uh huh."

Learner-Learner. In an interview, the instructor identified a concern for learner-learner interactions:

> "One of my earlier concerns was the [people] networking. Some of the most important people that have opened doors for me are people I've had classes with. That turned out not to be an issue. Because I've seen a lot of students at the distance learning classroom in regular [traditional] classes and they kept in contact with the other students. Some have even driven to visit with them. Many of the interactions [I've observed] were student-to-student and that is what you want in a class."

Although this interaction was not observed by the researcher, opportunity certainly existed outside the classroom environment. The students at the remote site traveled together for approximately 75 miles each way to attend class and commented that they knew each other socially and professionally.

At the beginning of the first observation period, the instructor rearranged the students' seating at the remote site and told them to sit at the same place each time for better visibility on the television monitor. The seating position of the students was recorded with the events during observations at the local site to study spatial arrangement of the students and to determine if proximity to the instructor or television monitors were a factor; however, no specific pattern emerged. The instructor took time to have students introduce themselves. Throughout the class, many of the students recognized each other on the television monitor screen and knew each other's names.

Before Observation 2 began, informal discussions occurred at the local classroom concerning beauty products in a magazine that one of the students brought to class. Many of the students at the local site were socializing as the facilitator showed the instructor how to copy pages on the fax machine. The facilitator then faxed the pages to the remote classroom and left the room.

During Observation 2, the students at the remote site occasionally exchanged comments without using their microphone when being viewed on the television monitor screen. There were several occurrences where private conversations took place at the remote site during lectures. The students at the remote site frequently talked privately without using their microphones, especially during the local student presentations. When the instructor noticed a private conversation between two students on the television monitor with a view of the remote site, she interrupted by asking, "What are y'all doin'?" They responded by saying, "Oh, we are just remembering things." Many of the private conversations between learners at the remote site were related to class activities or students at the local site.

The Case B classes met for three hours with a 15-minute break in the middle. During the break in Observation 2, the researcher collected data of the activities and comments that were observed. While students at the local site crowded around the instructor's desk to socialize and discuss their schedule of presentation topics, the students at the remote site were not visible on camera. Students worked cooperatively to schedule their required class presentations. One of the students at the local site faxed a schedule of presentations to the students at the remote site.

The instructor stayed in the local classroom during the break and talked to several of the students about what they do and where they work. Many of the students at the local site continued to socialize as others returned to their seats to continue the class. Students at the remote site were seen talking while they wait for class to begin. As the break period ended, the instructor demonstrated the camera movement to several of the students at the local site.

After class ended, the students at the remote site left almost immediately. As they were leaving, several students at the local site were talking to the instructor. The instructor remembered a video clip she forgot to show during class and played it for several students at the local site gathered around her desk.

As indicated in an interview of the instructor, the student presentations are an important objective for the class and an integral part of the instructional approach. When asked what was the most important instructional activity for the class, the instructor responded:

> "The peer presentations are the most important. The students agree because they have ownership. They felt that the class was theirs and they had some control over what was being done. That approach includes their evaluation of the presenters. A lot of the students chose this instead of taking a written test. Years ago, I took an objective from the class to teach and then I found it worked better if I taught something that was closer to home. Like this semester, some of the students did things such as clogging. OK, we're in adult education principles. Well, that's an adult leisure activity. One student was a medical person and

> brought in a lot of equipment. He showed how he trained people to use that equipment."

The student presentations provided opportunity for learner-learner interactions while preparing and presenting content via the videoconferencing technology. After a brief, 15-minute introduction to the technology and a limited amount of practice time using the videoconferencing console at the instructor's desk, students prepared and presented topics approved by the instructor for approximately 30-40 minutes. Students evaluated each other immediately following their presentations using a form provided by the instructor. Seldom did the presenter solicit interactions from the students at either the local or the remote sites. Three student presentations occurred during Observations 3 and 4. Two presentations were made from the local site and one was from the remote site. Due to class cancellations and rescheduling of examinations, all student presentations were observed from the remote site by the researcher.

Almost from the beginning of Observation 3, boredom with the presentation was apparent in the gestures, postures, and facial expressions of the students at the remote site. The presentation was segmented with frequent use of the expression "uh". The students at the remote site avoided interrupting the presenter as students at the local site often made comments without using their microphones.

Most interactions during his presentation were limited to the local site as the students at the remote site became increasingly isolated and detached from the discussion. This resulted in fewer interactions being recorded between the local and remote site, possibly due to a feeling of dissatisfaction at the remote site as indicated by their gestures. As laughter could be heard from the local site, the students at the remote site looked down at their desks.

As a presenter at the remote site began her presentation, a student that had been walking around during the presentations from the local site sat down at her desk. One student at the remote site began playing with her hair while another student carefully watched the presenter. No extemporaneous discussions like those during the local site presentations occurred during the presentation from the remote site. When the she was uncertain about a pronunciation, nobody offered any help. Very little interaction occurred during her lecture presentation. The students became passive listeners and less engaged than in the previous presentation. Most of the presentation was directed toward the students at the local site.

As the remote presenter concluded her lecture, applause was heard from the local site. The presenter solicited questions at the end of her presentation by looking up at the camera at the back of the room to address the students at the local site. After inviting comments or questions, one student responded at the local site followed by another.

Observation 4 began after a presenter at the local site clipped on a microphone, organized his materials, and set the camera views to their usual settings of the students at the remote site and himself. The students at the remote site discussed how they might sabotage the presenter because of his criticism of their presentations. Later in interviews, they said they were "mostly joking" but there appeared to be a degree of hostility by the students at the remote site toward the presenter because of what they considered to be "his opinionated views."

As the presenter was interrupted to provide handouts to students at the local site that arrived late, the students at the remote site began talking to each other without using their microphone. To gain student participation, the presenter singled out several students at the local site and prompted them for a response. When the students at the remote site were not included in the questions, they began discussions among themselves concerning the presenter's questions. At times, they appeared to be taking notes or completing the evaluation form for the presenter. The presenter ignored the students at the remote site as they continued their private discussion, even turning away from the view of the camera at times.

When a student at the local site interrupted the presenter with a comment, the presenter responded negatively to the student in an attempt to clarify a point. As they debated, the presenter informed the student that his view was incorrect and that he, the instructor, must not be communicating well, otherwise the student would agree with his view. As another student at the local site remarked, the students at the remote site paused their discussion to hear the debate at the local site. As the discussion continued, the students at the remote site began busily work on grading papers unrelated to the class.

While most students at the local site used their microphones as they responded to the presenter, the students at the remote site kept their discussion private. As the presenter mentioned that he was a 52 year old minister pursuing his doctorate, a remote student went to the back of the room to throw away some paper and made a comment as she passed another remote student.

The remote students talked and laughed throughout the presentation and their body language and facial expressions indicated their disagreement and disrespect for the presenter. As the presentation continued, they withdrew from participating and became mere observers. During his presentation, the student presenter included many of his personal views and judgements with animated hand gestures and good eye contact with the students at the local site. As he made joking comments, the students at the local site were laughing but there was still no response by the students at the remote site.

One remote student left the room near the end of the presentation and did not return until after the break in the middle of the class period. Several students at the local site applauded at the end but perhaps more out of courtesy than appreciation. During the break, students at the remote site commented to each other their resentment of the attitudes expressed by one of the local presenters. Later in interviews, they said they did not like his "sermon approach" and "the way he ignored the remote site."

Learner-Interface. The instructor was well aware of many of the difficulties encountered with the technology in a distance learning environment, as indicated in an interview when asked about strategies:

> "Making sure that the students not on site are part of the class -- that's the very first thing. After that, trying to combine the two classes so that they feel they are one group even through they are separated by space. Be prepared. Be sure that you are comfortable with it and that the students are comfortable with it. The students need training on the equipment."

Problems occurred when starting the videoconferencing system at the beginning of the first class meeting during Observation 1 with the researcher observing from the remote site. Once the system was operational, the instructor began reviewing the camera controls by zooming in on each student at the remote classroom.

After practicing for a moment, the cameras were positioned on the standard views of the students at the remote site on one television monitor and the instructor on the other television monitor. The instructor could be heard laughing with the students at the local site in the background. The facilitator explained the videoconferencing technology and described the location of the water fountain and restroom facilities at the local site. After the five students at the remote site arrived together, four sat on the middle row and one sat on the back row.

In Observation 1, the instructor connected a computer to the videoconferencing system for presenting electronic slides. Each slide contained several lines of text and was extremely dim on the monitor screen. When the facilitator at the local site zoomed to a close-up of one of the students at the remote site, the student became intimidated as the only one on the monitor screen. Several students at the remote site indicated shyness to being on camera when in a close-up view.

After the class began, the remote facilitator faxed the telephone numbers of the students at the remote site so they could be reached by telephone to resolve conflicts for presenting topics assigned by the instructor. There were seldom changes in the camera views during the student presentations except for an occasional item placed under the document camera which was difficult to read on the monitor screen because of the small print that was used. When asked, "What single factor would improve the class?" Students at the remote site responded, "the visuals could be better." During the presentation, distracting text identifying the camera appeared on the television monitor screen whenever the camera view changed.

When students at the local site responded to a question, they frequently forgot to use the microphone. That resulted in considerable frustration for the students at the remote site. At several times the students at the remote site loudly and abruptly interrupted the students at the local site demanding the use of their microphones. Occasionally, students looked at their microphone when speaking instead of the camera resulting in poor eye contact even with others in the same room. Out of frustration, one of the students at the remote site shouted over the microphone, "We can't hear you!" The instructor quickly responded with an emphatic, "He didn't say anything!"

Realizing the failure of the students at the local site to use the microphone, the instructor quickly repeated their comments for the benefit of the students at the remote site. Responses from students at both local and remote sites increased when the instructor engaged students in a discussion of issues concerning cultural and ethnic diversity followed by stories about her personal experiences while visiting Africa. As students responded, the instructor flipped between an electronic presentation on the computer and camera views of the students who were speaking. The instructor had trouble adjusting the camera on the student before they ended their comments. Camera events were infrequent and did not appear to influence interactions between the instructor and students.

Most camera changes occurred between the instructor and the document camera or electronic slide presentation from a computer. The computer presentation was very dim and difficult to read. The slides were used in previous classes but apparently had not been tested in the videoconferencing facility for this class. Use of the document camera was mostly limited to the student presentations. The instructor used a revealing technique with details on the slides.

The students at the remote site rarely saw the students at the local site on camera except during student presentations. In the student interviews, this revelation came as somewhat of a surprise to several students at the local site. Because the students at the local site could see the students at the remote site on their television monitor screen most of the time, they assumed that the students at the remote site could see them on their television monitor screen. However, the videoconferencing system was limited to only two simultaneous views, usually of the instructor or document camera and the other of the students at the remote site.

Before class began, the instructor remarked, "Priority will be given to the remote site whenever questions are asked." However, during activities toward the end of the class, the students at the remote site experienced difficulty getting the attention of the instructor and the students at the local site. Time was provided at the end of class for students to work cooperatively for planning their schedules to present topics to the class. After failing repeatedly to get the attention of the students at the local site to discuss schedules, the students at the remote site sat in apparent frustration. After a few minutes, the instructor suddenly announced to the students at the remote site, "Remote, you can go home now!", at which point, the students at the remote site gave up entirely on speaking with the students at the local site. While students at the local site could be heard working out their scheduling conflicts, the students at the remote site focused their attention on understanding the videoconferencing system by asking the facilitator questions.

During student presentations in Observation 3 and 4, learner-interface difficulties were particularly obvious. Data of local and remote student presentations represented a unique characteristic of Case B. No code of conduct was issued by the instructor before the student presentations except for limiting comments on the evaluations to constructive criticism. The instructor indicated that the student presentations would improve their understanding of the technology:

> "Actually having the students involved, giving them things to do, that's the only way you can get them comfortable -- training them on the equipment, having them use the equipment takes the fear away. I want the students to become comfortable with this mode of delivery and to feel that this is not only something they can do but something they can learn from and be a part of. I have to keep reminding myself there are students present that are not in your classroom and to pick up on their body language. I have to watch the eyes and hands. That is the biggest challenge of not being there. In a class on campus you develop the classroom culture. It's harder with those at the remote site. Even though we're not suppose[ed] to be, we are still a touchy-feely people. In the classroom, I can walk around and put my hand on someone. I have to concentrate on and compensate for this. Because of the distance you really can't get a good look at the students' faces if they're in the back of the room."

At the beginning of Observation 3, the facilitator faxed presentation materials to the local site. Students at the local and remote sites presented from a console desk at the front of each site using a clipped on microphone. The instructor stood at the back of the room at the local site. After focusing the document camera on a transparency, the instructor asked the local presenter to begin. While he presented, a remote student was silently communicating with other students at the remote site. Students at the local site began making comments without using the microphone and the students at the remote site commented to each other "we can't hear them". Judging their expressions, there was a lot of frustration but they did not interrupt the discussion. After a few moments, the students at the local site started using the microphones.

As an observer, a remote student at the front desk momentarily switched the camera view from the local document camera to the students at the local site. The local presenter abruptly asked that she change it to a view of him. Normally, only the instructor or presenter manipulated the camera views. The students at the remote site rarely saw the students at the local site. The view of the local site was mostly restricted to the instructor or presenter.

During the student presentation, one of the students at the remote site complained of a back problem and periodically paced at the back of the room. This activity was never observed during the instructor presentations. At several points, the instructor was heard speaking in the background without a microphone. Occasionally, the instructor used a microphone to address the entire class but continued to make comments from the back of the room without using a microphone. Toward the end of the presentation, several of the students did not agree with the findings of the research described by the presenter at the local site. After the presenter insulted a student with a comment, the instructor intervened.

At the remote site, the students began discussing the presentation without using the microphone. One remote student made several comments as a local student responded to the presenter. He continued his presentation as the students at the remote site voiced their disagreements only to each other. When he paused for questions, several students at the local site made comments but were barely heard in the background at the remote site.

The local presenter started organizing his notes as he placed scribbled information under the document camera. He referred to a handout and the students at the remote site commented to each other that they did not have the information. As the presenter at the local site continued, comments from students at the local site were heard in the background. The microphone cut out in the middle of a local student's question. As the local presenter responded to the question, the students at the remote site whispered comments about the local student. As the local presenter concluded his presentation, a remote student prepared for her presentation.

The presentation from the remote site began with the remote presenter on camera and using frequent hand gestures. Placed under the document camera, a typewritten page highlighting her points appeared very legible on the television monitor screen. The presentation was interesting and well executed. As the presenter looked up at the camera and switched between her view and the document, it was apparent that the presenter attention was focused primarily on the local site at a distance. The eye contact with the camera at the back of the room was actually better than with the students at the remote site directly in front of her.

The presentation was mostly lecture format without discussion or questions. With half of the students at the local site visible on camera, the students seemed attentive. Occasionally, noises from students at the local site could be heard in the background. As the presenter continued looking into the camera over the heads of the students at the remote site in front of her, several students at the remote site began looking down at their desks.

The presenter effectively switched the camera view between the document and herself. As the remote presenter paused briefly for comments or questions, she placed another neatly typed page under the document camera and referred to a spontaneous hand written comment on the page. As she continued with other pages under the document camera, her attention remained on the camera at the back of the room that was focused on a close-up view of her.

The remote presenter continued to switch back and forth between views of the document and presenter, and increased hand gestures even when she was not on camera. To focus the attention of the viewers, the presenter pointed to specific items on the document and included a remote student as an example in her lecture. The presenter solicited questions at the end of her presentation by looking up at the camera at the back of the room to address the students at the local site.

Before class began for Observation 4, one of the students at the remote site sat outside of the camera view to eat a sandwich. The instructor announced a class party would be held at her house during the week of final examinations. A facilitator at the remote classroom reminded the students to turn off the lights when they leave. As he left the classroom, he turned off the microphone at the front desk, which eliminated any background sounds from being heard. The only way the students at the remote site could be heard was by pressing the button on the microphones at their desks.

Occasionally, the presenter leaned over to look at his notes and distorted the sound by getting too close to the microphone that was attached to his shirt. Suddenly, from the back of the room, the instructor interrupted the presenter with a question but failed to use a microphone and was barely heard. In response to her question, the presenter indicated that his handout was incomplete because the original was 100 pages and therefore could not be faxed to the remote site in its entirety.

The students at the remote site continued to joke about the presenter and criticize him aloud but with their microphone turned off. They had requested that the microphone at the console desk in the front of the remote classroom be muted so they could talk without being heard. A student at the remote site went to the back of the room to throw away a piece of paper and remained turned away from the camera while speaking to another student as she passed by. Another student at the remote site was popping gum. During some of the student comments at the local site, the sound cut in and out preventing the students at the remote site from hearing all of the discussion at the local site.

During the presentation, the presenter mentioned that the instructor had provided him with handouts using larger text because of his visual problems. Although he said that his vision had been corrected to normal vision when using his glasses, it could explain his ignoring the students at the remote site during his presentation if he could not see them on the television monitor 30 feet away at the back of the room. When the presenter delayed for 10 seconds while he tried to locate a reference in his handout, the fax machine at the remote site began to ring. As a remote student approached, nothing was printed. Again, the fax machine began ringing. This time, something was printed but the students at the remote site ignored it. As the presenter continued, the fax machine rang again. There was a blank page left from the previous printing but as the student waited, nothing else appeared.

Finally, as the fax rang again and began beeping, the student became frustrated. In her confusion, she began discussing the problem with the rest of the class, shrugged her shoulders, and then returned to her desk after throwing away the blank pages. When asked what would improve the class, students at the remote site remarked, "phone calls and faxes could be used more effectively."

Comparison of Cases

The following analysis is divided into two sections, Observation Protocol Analysis and Categorical Analysis. The first section presents data collected during the observations which is arranged according to the protocols as prescribed in the adapted version of Flanders's Interaction Analysis. The analysis is arranged into three subsections: (a) Instructor events, (b) Student events, and (c) Other events including general comments, delays, group discussions, and camera changes.

The Categorical Analysis section provides an analysis of the textual data obtained from field notes, comments entered in the OPS, and interviews. It provides details concerning the nature of the events and represents the patterns and essence of the experience as interpreted by the researcher, instructor, and selected students.

Observation Protocol Analysis

Comparing Cases A and B in other than general terms could prove unproductive due to considerable differences among the students and instructors. Although, class sizes at the local and remote sites were similar in size, many of the Case A students were several years younger than the Case B students. The students at the remote site in Case B represented a less than random selection which led to the formation of social behaviors by students who had previously scheduled classes together and traveled 75 miles together to attend this class. Although the instructors demonstrated several instructional strategies, their expertise and ability to deliver specific techniques greatly varied.

Instructor Events. Cases A and B indicate a higher percentage of instructor events were directed toward students at the local site than the students at the remote site. During lecture, as in Case A, one might expect a higher percentage of events directed toward the entire class than during discussions as in Case B. However, Case B demonstrated a larger percentage of instructor initiated events that were directed toward the entire class than did Case A (see Table 13).

Table 13

Comparison of Instructor to Local, Remote, and Student Events for Case A and B Observations.

Target	Case A		Case B	
Instructor-to-entire-class	214	61%	128	81%
Instructor-to-local-students	76	22%	21	11%
Instructor-to-remote-students	61	17%	10	8%

As defined by the observation protocols, the instructor events were categorized by seven types: (a) Accepts and clarifies, (b) Praises or encourages, (c) Acceptance of ideas, (d) Ask questions to solicit a response, (e) Lecturing, (f) Giving directions, and (g) Criticizing (see Table 14). When analyzing the instructor events by type, most of the Case A instructor events directed toward the students at the local site were recorded as "Acceptance of ideas" (47%) and as "Praises or encourages" (26%). Although still high, Case

B instructor events for acceptance and praise are overshadowed by events of criticizing, especially toward the students at the remote site (25%).

Table 14

Frequency of Instructor-to-Student Events by Type for Cases A and B.

Type of Event	Case A			Case B		
	Local	Remote	All	Local	Remote	All
(1) Accepts and clarifies	12 16%	20 33%	2 1%	5 24%	1 6%	4 3%
(2) Praises or encourages	21 27%	11 18%	7 3%	3 14%	2 12%	5 3%
(3) Acceptance of ideas	36 47%	16 26%	4 2%	5 24%	4 25%	4 3%
(4) Asks questions to solicit a response	5 7%	6 10%	44 21%	2 9%	2 13%	69 44%
(5) Lecturing content	2 3%	0	136 63%	1 5%	0	64 41%
(6) Giving directions	0	8 13%	21 10%	4 19%	3 19%	7 4%
(7) Criticizing	0	0	0	1 5%	4 25%	3 2%

Note: Percentages are calculated by column to represent the percent of the event type. The column 'All' refers to the events interactions with the entire class.

Case B instructor events for asking questions (44%) did appear more balanced with lecturing (41%) than did Case A instructor. However, they were mostly directed at the entire class in an attempt to encourage responses from the students when the instructor demanded, "Why don't you people respond?" The high number of events for "giving directions" in Case B were due to the complexity of describing the requirement, procedures, and organization of student presentations. In Case A, the events for "giving directions" were related to equipment problems and examinations.

Student Events. The student events were categorized by four types: (a) Response-to-instructor, (b) Response-to-student, (c) Initiated-to-instructor, and (d) Initiated-to-student. While both cases appeared effective in response-to-instructor events, Case A was more efficient with 67 responses to 55 questions in comparison to 67 responses to 73 questions for Case B. Even when considering the greater observation time, Case A exhibited a much greater number of initiated student-to-instructor events with 124 to only 35 for Case B (see Table I5). Neither instructor effectively encouraged events between the students. Although, the instructor in Case A appears highly effective in encouraging student initiated-to-instructor events from the remote site than the instructor in Case B, 20 of the events were not content related but referred to students at the remote site requesting that the instructor remind others to turn on their microphone when speaking.

Table 15

Frequency of Student Events by Type for Cases A and B.

Type of Event	Case A			Case B		
	Local	Remote	All	Local	Remote	All
(a) Response-to-instructor	50 41%	16 24%	1 33%	48 64%	6 38%	10 91%
(b) Response-to-student	1 1%	0	0	1 1%	1 6%	0
(c) Initiated-to-instructor	71 58%	51 76%	2 67%	26 34%	8 50%	1 9%
(d) Initiate-to-student	0	0	0	1 1%	1 6%	0

Note: Percentages are calculated by column to represent the percent of the event type. Student presentation data is not included for a comparison of the instructor data. The column 'All' refers to interactions with the entire class.

However, 15 of the student initiated-to-instructor events were a result of thought-provoking questions during book reviews in Observation 5 and questions related to examination preparation during Observation 6. In Case B, two of the eight student initiated-to-instructor events from the remote site were unrelated to the content. The other six events occurred during lecture by the instructor in Observations 1 and 2.

Other Events. Other events were categorized by type as: (a) General comments concerning instructional techniques, note taking, eye contact, and student behaviors; (b) Brief delays or periods of confusion, (3) Group discussions; (c) Technical problems; (d) Document camera events; and (6) Other camera events, which typically included changes in the view of the instructor or students. Unlike previous sections of this analysis, these values are independent of the number of students at each site and represent a comparison of the instructor techniques and specific events that occurred during the observations (see Table 16).

As indicated by six references in the "General comment" events, note taking was more noticeable in Case A than in Case B. Other comments referred to the instructional techniques and student behaviors which are described in more detail in the following categorical sections. Brief periods of delay or confusion, not attributed to technical delays, occurred more frequently in Case B than in Case A. Most delays were less than five minutes in duration. Delays occurred in Case A for occasional note taking and the completion of evaluation forms, whereas, delays in Case B included deciding topics for student presentations for approximately 15 minutes and the completion of questionnaires used during student presentations.

Table 16

Frequency of Other-Events by Type for Cases A and B.

Type of Event	Case A		Case B	
(a) General Comment	16	41%	23	59%
(b) Brief delay or confusion	6	27%	16	73%
(c) Group discussion	4	50%	4	50%
(d) Technical problems	4	67%	2	33%
(e) Document Camera	51	71%	21	29%
(f) Other Cameras	99	94%	6	6%

Note: Percentages are calculated by row to represent a direct comparison of the events between cases.

There were four events identifying the start of a discussion period for each of the cases. However, group discussion events for Case A were shorter and more directed during preparation for examinations and book review discussions.

Four technical problems occurred during observations of Case A, which included the loss of electrical power, poor audio, camera adjustments, and trouble with faxing of documents. Some of these conditions resulted in the cancellation of planned observations and the early termination of Observation 5. Weather resulted in the cancellation of at one other observation. Data collection ceased whenever interactive distance learning was unavailable. Although there were fewer technical problems in Case B, it still resulted in the cancellation of several observations and the withdrawal of some data.

In Case A, the extensive use of the document camera as a chalkboard and map display resulted in a large number (51) of document camera events. These events included comments concerning pointer techniques and quality of presentation. In interviews with the instructor, it became clear that the instructor considered this feature of the system to be extremely important. Similarly, the instructor in Case B also considered the use of electronic presentations to be a valuable tool but used a computer display more than the document camera for instruction. In contrast, the effectiveness of the computer display was diminished by poor visibility and lacked some spontaneity that was observed when the Case A instructor highlighted certain events and locations using the document camera.

There were several contributing factors to the wide disparity in other camera events between the cases. Case A camera events were driven by continual changes of view between the document camera and views of the instructor during the lectures. The mediator often facilitated the camera changes by manipulating the camera controls for the instructor, thereby allowing the instructor to concentrate more on the content. This was especially true when attempting to locate students on camera as they were speaking. The Case B instructor had no assistance in adjusting the camera views. During the student presentations, very few changes occurred due to a lack of student expertise with the technology.

In interviews, the instructor for Case A indicated that he considered having someone manage the camera changes to be a real advantage for his presentations. This was especially true when considering that there were six cameras between the sites including the two document cameras but only two views were visible simultaneously. Since one camera remained focused on the remote site almost exclusively, that left only one other view to share between the documents, instructor, and students at the local site.

The discussions during Case B observations posed a significant challenge for the instructor to focus on what the students were saying while concentrating on camera movements. Even with the mediator assistance in Case A, a student would stop talking by the time he was located on camera. In Cases A and B, there was a decline in the number of camera view changes during discussions led by the instructors.

Categorical Analysis

The Categorical Analysis section includes textual data from the observation events and interviews. It provides details concerning the nature of the events and captures the essence of the experience as interpreted by the researcher, instructor, selected students, and mediator.

Using the interaction model described by Moore (1989) and later appended by Hillman et al. (1994), the textual data in the categorical sections are grouped into the following categories: (a) Learner-content, (b) Learner-instructor, (c) Learner-learner, and (d) Learner-interface. These categories provide a framework for summarizing interactions that occur in distance learning environments (Moore, 1989).

The student interviews, which were conducted by telephone and following observation periods, consisted of 18 local and 50 remote collective responses to 10 questions. Two separate interviews were conducted for each instructor, which included responses to 154 questions.

In Cases A and B, there were many similarities in the student responses from the interviews. None of the students in Cases A and B had any specific expectation of the distance learning experience. Most students at the remote site perceived that the quality of the interactions was the same as those at the local site but the interactions were shorter and occurred less frequent. Several of the students at the local site in Cases A and B did not realize that the students at the remote site could not see them on the television monitors most of the time. With only two views possible, the instructor and either the document camera or the students at the remote site were visible simultaneously. All students at the remote site in Case B considered the experience favorable and said they would attend another videoconference class; however, two students at the remote site in Case A indicated that they would "only attend a videoconference class if it was required and otherwise unavailable."

In both cases, as the class ended, students at the local site crowded around the instructor's desk. When asked to "Describe how your interactions with the instructor are different from a traditional classroom?" Several students at the remote site said, "we missed out on the before and after class activities." They also agreed that the instructor seemed to know several of the students at the local site by their first name better than they did the students at the remote site. However, most students at the remote site thought the instructor would probably recognize them when meeting in person.

Learner-Content. Cases A and B were similar with respect to assigned readings and the expected participation of the learner during class discussions of the material. While lecturing, Case A instructor used hand-written materials, book pages, and maps placed under the document camera during all observations with occasional films; whereas, Case B instructor used a computer presentation during the first observation only.

All of the student presentations in Case B used the document camera for displaying materials but most were difficult to read and therefore ineffective for communicating information. Copies of the materials were distributed for the presentations but were not always available at both the local and the remote sites. Some of the distributed materials did not match the materials placed under the document camera.

Learner-Instructor. The Case A instructor frequently used humor when lecturing, whereas, Case B instructor brought up controversial issues. Both instructors presented stories from personal experiences to make the content more relevant to the students. While the instructor in Case A relied on a student from the area studied in the class to give his perspective on certain attitudes, Case B instructor prompted many different students for their opinions. Occasionally, the opinions of the students in Case B drew criticism from the instructor. The instructor in Case A seemed more accepting of student comments and perspectives, which stimulated discussions of the content.

Face-to-face interaction was a concern for students for both classes at the remote site. Although both instructors acknowledged the benefits and indicated that the students preferred they visit their location at least once during the course, neither instructor traveled to the remote site. Case B instructor commented:

> "The students suggested that the instructor visit the remote site and present. I don't think I'll do that. It's too time consuming. I'm sure that would be effective if you have the time."

Learner-Learner. In Case B, a considerable potential for interaction existed outside of the scheduled class time while the students at the remote site traveled together approximately 75 miles each way to attend the course. However, in Case A, most learner-learner interaction was limited to the time during class. Neither instructor was very successful in encouraging learner-learner interactions during their lectures. However, during a book review discussion in Observation 5 with Case A, a slight increase in interactions between students emerged when the instructor involved the opinions of a student from Romania.

Although the student presentations in Case B provided considerable opportunity for learner-learner interaction, most interactions were only one-way, initiated by the student presenter to the learner with very few responses. The quality and content of the presentations resulted in many attitude and behavioral problems especially at the remote site. These problems were never observed in Case A, although several of the students at the remote site in Case A revealed their disapproval of a particular student at the local site for asking too many questions and making frequent comments.

Learner-Interface. Problems occurred with the sound and picture at unpredictable times during the study. During one observation, a bird flew into the local site during class and disrupted the entire process. On at least two occasions the system failed to work properly and data collection halted. Observation 5 was terminated 15 minutes early when the power to the building was turned off. Weather conditions cancelled an observation at the remote site but the class continued at the local site. Students at the remote site viewed videotape of the class two weeks later without instructor interaction. Many events related to learner-interface interactions occurred during observations in both cases.

The following table illustrates a componential analysis (Spradley, 1980) of those factors (see Table 17).

Table 17

Componential Analysis of Learner-Interface Events.

Learner-Interface Events	Case A	Case B
Visual Presentation		
Poor quality computer display		X
Use of maps	X	
Videotape playback	X	
Poor quality visuals		X
Sound Presentation		
Microphone activation problems	X	X
Excessive volume at local site when using microphones at the remote site	X	X
Student Related		
Visual fatigue when viewing monitors for extended periods	X	X
Visual cues, eye contact, facial expressions	X	X
Looking at microphone when Speaking		X
Isolation of the remote site	X	X
Reluctance to being on camera		X
Peer presentations		X
Side conversations		X
Camera Related		
Close-up camera views		X
Camera movement difficulty	X	X
Document camera switching	X	X
Camera switching between instructor and documents	X	

Visual Presentation. In Case B, computer presentations with distorted colors and illegible text made lectures difficult to follow. During peer presentations, items placed under the document camera often included small black type on white paper that was visually unappealing and difficult to read. In Case A, books, maps, films, and video tape segments highlighted the content and enhanced learner-content interactions.

Sound Presentation. Interactions of the learners in both cases were adversely affected by the awkwardness of using the microphones. Even with the instructors reminding students to use the microphone when speaking, students frequently failed to do so. The proximity of the students to the microphones at the remote site varied, which sometimes resulted in excessive volume at the local site. The sudden interruption caused the instructor to look up at the speakers attached to the walls when students at the remote site would speak.

Student Related. Less focused attention occurred when students experienced visual fatigue. Students were required to look up at an angle for extended periods to view the monitors. Also, when camera changes were infrequent, students seemed less attentive to viewing the monitors, which led to a more passive behavior in both cases with fewer interactions.

Visual cues or feedback, body language, eye contact, and facial expressions were difficult to observe by the instructors and the students at both sites. The students at the local site were rarely in camera view and the camera view of the students at the remote site was usually wide-angle and at a distance. Students at both sites often looked at the microphone when speaking instead of the monitor or individual to whom they were communicating. Because of limitations of the technology, instructors complained of their inability to achieve interactions with the students at the remote site. The students at the remote site described feelings of isolation and being left out of discussions.

Students at the local site frequently responded to instructor questions before the students at the remote site. A pattern evolved whereby students at the remote site often waited for the students at the local site to respond. If a question was addressed by students at the local site, the students at the remote site felt that no response from them was necessary. In Case A, the mediator encouraged the students at the remote site to respond by interacting face-to-face.

The lowest period of interactions occurred during Case B peer presentations. Using a primarily lecture format for a duration of approximately 40 minutes, students were required to interact with the videoconferencing technology while delivering instructional content. Many of the students demonstrated poor technical skills and did not effectively communicate their ideas when confronted with learner-interface difficulties. Consequently, frequent side conversations developed, many of which exhibited behavioral problems.

In both cases, some of the students at the local site did not realize they were seldom on camera. Many of the students indicated their reluctance to be viewed on the monitors. Placing the camera on students may have actually inhibited interactions as they became aware of their presence on the monitor.

Camera Related. In Case A, fewer camera changes occurred when the instructor's technical ability was challenged or his attention was focused on verbal interactions or instructional delivery. Despite the potential of the cameras to enhance interactions by providing visual feedback of those speaking, verbal interactions were actually higher when the frequency of camera changes were low.

Chapter 5

Discussion

In conclusion, this chapter discusses the findings of this research as they relate to the following questions:

1. What was the nature of the interactions that occurred between instructor and students at and between the delivery and a remote site?

2. How were the interactions affected by the instructional strategies used?

3. What were the attitudes and perceptions in distance learning when using interactive videoconferencing?

The conclusions are followed by a section on implications for practice that describes specific strategies for distance learning through two-way interactive videoconferencing. The final section contains recommendations for future research.

Conclusions

Interactive videoconference technology creates a different learning environment to which both instructor and students must adapt. Limited mobility behind the instructor's console at the front of the classroom, lack of face-to-face contact with the students at the remote site, and sound activation delays create a "transactional distance" that embodies both physical and psychological effects that must be overcome by the instructor and students (Moore & Kearsley, 1996, p.200). To what degree they adapt may affect the success of learning. In this study, the researcher observed interactions that occurred during two courses offered via interactive videoconferencing. Questions regarding the nature of the interactions, instructional strategies, and attitudes and perceptions were examined.

Nature of the Interactions

Using the interaction model described by Moore (1989) and later appended by Hillman et al. (1994), conclusions of the nature of interactions are grouped into the following categories: (a) learner-content, (b) learner-instructor, (c) learner-learner, and (d) learner-interface. These categories provide a framework for classifying interactions that occur in distance learning environments (Moore, 1989).

Learner-Content. Content materials such as books, maps, and films provided opportunities for learner interaction. The effectiveness of these materials may be dependent on the presentation skills of the instructor using electronic delivery systems such as document cameras, computer software, and videotape playback systems. Providing a close-up camera view of details under the document camera combined with verbal descriptions from the instructor enhanced learner-content interaction for the students. As a result, students at the remote site maintained focus on the content and followed the instructor presentation more effectively. References by the instructor to current events also increased learner-content interactions by encouraging students to read local and international newspapers and to recognize news events related to the class.

Learner-instructor. Learner-instructor interactions were highest during discussions such as book reviews and examination preparation. During lectures, statements of praise and acceptance of student ideas by the instructors increased interactions with the students at the remote site. Probing questions directed toward students at the remote site that required the learner to synthesize and draw conclusions rather than simply look up an answer were effective in soliciting their responses. Using controversial issues and soliciting personal experiences from the students at the remote site were also effective in increasing interactions.

Learner-instructor interactions were impaired by limitations of the technology. When instructors experienced difficulty in discerning aural and visual cues from the remote site, transactional distance increased. As indicated by other research (Heath & Luff, 1992; Sellen, 1992; Mantei et al., 1991), lack of body language and audible cues can result in poor communication between the instructor and students at a remote site. Without visual and aural feedback, the instructors felt compelled to periodically pause their lectures and solicit questions by prompting, "Are there any questions?" Response to this type of questioning was ineffective in increasing interactions and considered unnecessary by the students at the remote site.

Learner-learner. According to Saba and Shearer (1994), an increase in the level of learner control results in an increased rate of dialog, thereby reducing the transactional distance. Despite the fact that both instructors and students valued interaction during classes, instructor efforts to increase learner-learner interaction were ineffective. Use of peer presentations as an instructional strategy to increase learner-learner interactions actually resulted in a decrease in interactions from the students at the remote site.

Feelings of isolation typical in distance learning environments as described by Care (1996), contributed to fewer interactions during class. Many learner-learner interactions occurred before and after class when students at the local site gathered around the instructor's desk for informal conversations. Students at the remote site reported that they felt excluded from these conversations. This feeling of isolation extended into the class and may have contributed to a higher level of transactional distance as described by Moore and Kearsley (1996). Consequently, side conversations developed at the remote site that were inaudible to participants at the local site. In fact, students deliberately turned off their microphones to restrict their conversations to the remote site. Although research indicates that side conversations may be productive clarifications of material presented (Mantei et al., 1991), conversations observed in this study during peer presentations demonstrated negative behaviors such as disapproving facial expressions and joking comments.

Learner-interface. As reported in research (Hillman, Willis, & Gunawardena, 1994; Ritchie & Newby, 1989), interactions between students at the remote site and the instructor and students at the local site are affected by the technology. Many events related to learner-interface interactions occurred during observations of this study that were both favorable and unfavorable.

Computer presentations with distorted colors and illegible text made lectures difficult to follow. During peer presentations, items placed under the document camera often included small black type on white paper that was visually unappealing. As a result, learner-content interaction decreased. However, use of books, maps, films, and video playbacks enhanced learner-content interactions.

Interactions of the learners were adversely affected by the awkwardness of using the microphones. Even with the instructors reminding students to use the microphone when speaking, students frequently failed to do so. When students at the remote site used the microphone, a louder than normal voice was heard over a speaker at the local site causing the instructor to look up at the speaker instead of the monitor which viewed the student who was speaking.

Visual fatigue was observed with students at the remote site after approximately 30 minutes of viewing the monitors. When camera changes were infrequent, students seemed less attentive to viewing the monitors, which led to a more passive behavior with fewer interactions.

Visual cues or feedback, body language, eye contact, and facial expressions were to observe by the instructor and the students at both sites. The students at the local site were rarely in camera view and the camera view of the students at the remote site was usually wide-angle and at a distance. Students at both sites often looked at the microphone when speaking instead of the monitor or individual to whom they were communicating. Because of limitations of the technology, instructors complained of their inability to achieve interactions with the students at the remote site. The students at the remote site described feelings of isolation and being left out of discussions.

As a result, students at the local site frequently responded to instructor questions before the students at the remote site. A pattern evolved whereby students at the remote site often waited for the students at the local site to respond. If a question was addressed by students at the local site, the students at the remote site felt that no response from them was necessary.

The lowest period of interactions occurred during peer presentations. Using a primarily lecture format for a duration of approximately 40 minutes, students were required to interact with the videoconferencing technology while delivering instructional content. Many of the students demonstrated poor technical skills and did not effectively communicate their ideas when confronted with learner-interface difficulties. Consequently, frequent side conversations developed, many of which exhibited behavioral problems.

While some of the students at the local site did not realize they were seldom on camera, many of the students at both sites indicated their reluctance to be viewed on the monitors. Placing the camera on students may have actually inhibited interactions as they became aware of their presence on the monitor.

Fewer camera changes occurred when an instructor's technical ability was challenged or his attention was focused on verbal interactions and instructional delivery. Despite the potential of the cameras to enhance interactions by providing visual feedback of those speaking, verbal interactions were actually higher when the frequency of camera changes were low.

Instructional Strategies

Research (Ritchie, 1991) indicates that the frequency of interactions occurring within a face-to-face setting is usually limited where lecture is the primary instructional strategy, but even fewer interactions occur when communicating via electronic media. When compared to a traditional classroom, verbal interactions over electronically mediated instruction were less frequent, shorter in duration, more serious in content, somewhat business-like, and very task-oriented (Hiemstra, 1982).

Therefore, the successful use of this emerging technology may require modifications in customary instructional strategies and a clearer understanding of the process. Instructors require skill and a high comfort level in interfacing with interactive videoconferencing technology. Pre-course training may help faculty and students maximize their distance learning experience by providing them with additional skills or information. The following specific strategies were identified as factors in this study.

Probing Questions. Use of probing questions directed toward the remote students was more effective in soliciting student responses than generalized statements. Interactions increased when the instructors required the students to respond to thought-provoking questions to which there were many possible answers. Once engaged, the students at the local site helped draw the remote students into the discussion. Controversial issues may be raised to solicit the students' opinions. The instructor can humanize the students' learning experiences by using their names and personal information to stimulate participation, increase interactions, and thereby reduce the transactional distance (Moore & Kearsley, 1996).

Document Camera. Students and instructors considered the document camera to be effective when displaying maps and highlighting important information. Effective use of the document camera allowed the instructors to focus the attention of students at local and remote sites.

Rather than referencing a single map hanging at the front of the classroom, one instructor used several detailed maps placed under the document camera highlighting specific references to locations by pointing with a finger, pencil, or pen. To represent the information textually, the instructor wrote on a sheet of paper under the document camera to highlight and organize important event dates, and spell the peoples' names and places where events took place as they were discussed. As the instructor wrote the information, opportunity was provided for the students to formulate questions and interrupt the lecture.

Many students preferred this technique to a more traditional chalkboard and map on the wall because of greater visibility and ease of following the instructor cues. However, students became disoriented when the lecture continued with the instructor off camera for more than a few seconds. This was particularly apparent during book reviews and preparation for examinations, when the instructor concentrated on dialog with the students and the camera lagged behind displaying information from the document camera. Greater preparation and technical training may be required to overcome camera lag and where possible, automation or assistance may be helpful.

Several options exist for automating camera movement. One approach is to move the camera to pre-selected locations such as each side of the classroom or specific areas. The instructor can store the location and zoom-in position of individual students. The instructor then selects them as needed. Another approach is to use tracking signals to locate individuals carrying a transmitter device. These are often used for following the movement of the instructor around the classroom. Use of a trained camera assistant can be very effective in anticipating the camera changes.

Mediator. As indicated by other studies (Burge & Howard, 1990; MacKinnon et al.), mediator activities at the remote site focused more attention on the students at the remote site. The mediator encouraged learners to use their microphones and stimulated conversations at the remote site.

Initially, the role of the mediator was limited to that of a passive observer and facilities manager who opened and closed the classroom, turned on and off the videoconferencing system, and called roll for the remote site at the start of each class. As the course progressed, the mediator took a more active role in changing the camera views for the instructor, repositioning the camera for views of the students, and stimulating interactions at the remote site.

The nature of the mediator interaction also changed. Occasionally, the instructor solicited the opinions and comments of the mediator concerning current events and book review discussions. Without using the microphone to avoid interrupting the local site, the mediator discussed instructor questions and responses of the students at the local site with the students at the remote site. He attempted to clarify points of discussion without challenging the instructor's comments. As a result, the remote site became a class within a class with interactions occurring independent of the local site.

The use of a mediator can be an effective strategy for reducing transactional distance. By manipulating the cameras, the mediator allowed the instructor to focus more attention on interacting with the students. By assisting learners in interfacing with the technology and monitoring conversations face-to-face at the remote site, the mediator served as a mentor for the students and a sounding board for the instructor.

Attitudes and Perceptions

Research has found that student satisfaction and perceived learning in distance education are affected by the availability of interaction (Hackman & Walker, 1990). When students interact regularly with the instructor and other students, increased motivation and higher quality learning experience were reported (Shale & Garrison, 1990). Fulford and Zhang (1993) found that students' perceptions of high levels of classroom interaction corresponded to higher levels of satisfaction. The following attitudes and perceptions were identified as factors affecting interactions in this study.

Peer Presentations. While peer presentations may provide opportunities for students to gain experience using an electronic format and interactive videoconferencing system, learner-interface problems due to lack of experience led to increased transactional distance and low student satisfaction. Most learner-

learner interactions that occurred during the peer presentations were limited to the local site. The students at the remote site became increasingly isolated and detached from the discussion. This resulted in fewer interactions being recorded between the local and remote site and a feeling of dissatisfaction at the remote site.

Students at the remote site developed negative attitudes that were exhibited as inappropriate behaviors. Although negative attitudes that develop between certain individuals during peer presentations could also occur in a face-to-face learning environment, seclusion of the students contributed to the emergence of the negative attitudes and to the degree to which they manifested. As found in other research (Storck & Sproull, 1995), students formed more positive impressions of each other in a face-to-face setting than at a distance. When physically isolated and inconspicuous with very little chance of being confronted by the other students, the students at the remote site developed attitudes that resulted in negative behaviors and inappropriate interactions that were essentially unobserved by the other site.

The students at the remote site talked and laughed throughout the presentations of students at the local site. Their body language and facial expressions indicated disagreement and disrespect for the local site presenters. At the remote site, the presentation was directed toward the instructor and students at the local site. Because there were more students at the local site, the potential for peer evaluation was greater. The physical distance may have induced some psychological distance that fostered this behavior.

Learner-interface. Students at the remote site perceived using the microphone to make comments as an intrusive action. When the instructors solicited responses from the students, the students at the remote site waited to see if a student at the local site would respond to the instructor before interacting.

Consequently, fewer interactions occurred between the students at the remote site and the instructor at the local site. This perception was reinforced by frequent questions and comments from a local student who dominated class discussion. In a face-to-face environment, students anticipate questions and comments by raising their hand or observing the instructor's facial expressions. This becomes difficult over distances linked by technology. The students at the remote site may require special attention to overcome their perception of interrupting the class even when participation in the discussions is considered important.

Achieving low transactional distance may be difficult for those that are familiar with the technology yet unaware of specific techniques required to interact using electronic devices such as microphones. Students at the remote site indicated their continual frustration when others at the local site forgot to press the switch on their microphones when speaking. Although the instructors frequently reminded the students at the local site to repeat what was said into their microphones, problems with learner-interface plagued communications throughout the courses.

As indicated by research (Abbott, Dallat, Robinson, 1995), student attitudes followed that of their instructor when technical problems occurred. In this study, the instructors were very accepting of technical delays and cancellations due to malfunctions perhaps because the majority of the class was present at the local site where they taught. When technical problems prevented the four participants at the remote site from interacting with twenty others at the local site, the impact to the overall class was small. Most of the students at the remote site considered the experience as favorable and indicated that they would take another course offered through videoconferencing in the future.

Mediator. As indicated by research, site bias can occur when more attention is given to the local site where the instructor is located. This created frustration with the remote neglected learners. As predicted by Burge and Howard (1990), the mediator developed a personal rapport with the students at the remote site that promoted satisfaction during the course.

In summary, many factors influence interactions within an instructional interactive videoconferencing environment. Using the interaction model described by Moore (1989) and later appended by Hillman et al. (1994), factors may be grouped into the following categories: (a) Learner-content, (b) Learner-instructor, (c) Learner-learner, and (d) Learner-interface. These categories provide a framework for classifying interactions that occur in distance learning environments (Moore, 1989). The following table describes important factors by category that influenced interaction in this study (see Table 18).

Table 18

Summary of Factors Influencing Interactions.

Categories	Favorable	Unfavorable
Learner-content	Books, maps, films and videotape, current events, mediator	Poorly constructed visuals
Learner-instructor	Use of document camera, mediator, discussion format when combined with probing questions, controversial issues, praise and acceptance of ideas, and humanizing strategies	Instructor pausing the lecture to prompt the students at the remote site for questions, lack of visual and aural cues and feedback limited by technology
Learner-learner	Mediator	Peer presentations, feelings of isolation, psychological distance
Learner-interface	Mediator	Use of microphone switch, speaker volume, camera lag, lack of effective communication techniques

Implications for Practice

Instructor accessibility for dialog and problem solving with the learners is viewed as a necessary element of any distance learning endeavor. The instructors must not rely on contact with the students only during class meetings. Telephone, facsimile, electronic mail, and voice mail can enhance interactions with learners; especially when the instructor never meets face-to-face with their students at the remote site. Prior research and findings of this study suggest the following recommendations related to lecturing, peer presentation, discussion format, and mediator strategies.

The expertise of the instructor in Case A supports Brenzel's (1995) view that students need to experience, as directly as possible, the best minds in their field of interest. One instructor in this study was considered not only an expert in his field, but also an accomplished presenter capable of delivering an informative and interesting lecture. Interviews of the mediator and students revealed that some students took the course partly because of the instructor's reputation. However, Brenzel strongly objected to simply transferring the traditional method of lecturing into an electronic format. To reduce transactional distance by increasing the interactions, an assortment of techniques should be used when lecturing.

Instructors should supplement their lectures by placing realia and visuals under the document camera and showing films and video to provide scaffolding for the students. In addition, using current events to bring real-life drama and relevance to the subject matter may stimulate interest and interactions. During lecture, statements of praise or acceptance of ideas by the instructor should be used to encourage interactions from the students at the remote site.

Probing questions that are directed toward students at the remote site should be used to solicit their responses. Rather than simply delivering content by lecturing, the instructor should employ a constructivist approach by: (a) designing experiences where learners are required to examine thinking and learning processes; (b) collect, record and analyze data; (c) form and test hypotheses; (d) reflect upon previous understandings; and (e) construct their own meanings. Having students provide questions gives insight into their perception and ideas of the content being discussed. As suggested by Moore and Kearsley (1996), establishing an environment that places importance on the individual to generate a feeling of group rapport can help overcome the perception of isolation typical in a distance learning setting. Referring to students by name, soliciting their ideas and opinions, and relating to their personal experiences can stimulate interactions with the students at the remote site.

Although the attitudes that developed between certain individuals during the student presentations could also occur in a traditional learning environment, learner-interface problems contributed to their emergence and to the degree to which they manifested by not providing a more observable environment. Unsupervised students at the remote site can lead to inappropriate behaviors especially during peer presentations.

The instructor could provide guidelines and procedures to help foster better attitudes and learning. Better preparation and planning of peer presentations is needed to accomplish a sufficient level of success when using this instructional approach. Adequate hands-on training for the student presenters, discussion of appropriate behaviors, and an understanding of the affects of transactional distance may be necessary before engaging in those activities. Peer presentations could be limited to a short duration combined with other activities.

When including activities, special attention must be given the remote site to ensure that interaction occurs. Discussions during activities such as book reviews and examination preparation can produce high periods of verbal interactions when combined with effective lecture strategies. When the attention of the instructor is focused on verbal interactions during discussions, efforts to avoid camera lag and learner-interface become more problematic. There are several approaches to addressing these problems.

Microphones that are always active during class are becoming more common. However, this does not fully address the process of interacting. To achieve a natural approach to interacting in a classroom environment, the instructor needs more feedback, both aural and visual, from the students at the remote site to simulate the nuances that occur in a face-to-face setting. For example, a signal from a student at the remote site could appear on the instructor's monitor or console panel when a question is raised. By pressing a button, the instructor would respond to the student at an appropriate point in the lecture and the camera would automatically switch views and focus on the student with the question. These capabilities may currently exist in some videoconferencing systems but certainly are not common place at this time. As complexity of the system increases, chance of technical problems becomes greater.

The use of a mediator may help facilitate this process. By manipulating the cameras, a mediator allows the instructor to focus more attention on interacting with the students. A mediator can assist learners in interfacing with the technology and monitor conversations face-to-face at the remote site. In addition, a mediator can serve as a mentor for the students and a sounding board for the instructor. As the number of learners increases at the remote site and multiple sites occur, the use of mediators at the remote sites may become even more necessary to achieve acceptable levels of interaction and satisfaction among learners.

Future Research

In 1994, Miller and Clouse suggested that as new technologies such as fiber optics, compressed video, and interactive conferencing evolve, continued research is needed to describe and refine the nature of the distance learning process and the changes in instructional strategies for their effective use. As in this study, strategies to improve interactions when using interactive videoconferencing in distance learning have been recommended. Rather than observing the nature of interactions, more studies describing the outcome and effectiveness of the implementation of those recommended strategies to improve interactions are needed.

Future studies could establish guidelines to determine standards and for normal levels of interactions and determine how the quality of the interactions could be quantified. For example, students at the remote site perceived excessive questions and comments by certain students at the local site to be a nuisance. Additional research could identify thresholds for instructor-student interactions as perceived by the instructor and other students and determine the effects of transactional distance.

As peer presentations become more prevalent for students to gain experience using the videoconferencing technology, prerequisite skills and training for the students should be identified and integrated into the methodology of the course activities. Further research into this process with specific recommendations describing the essential components would be helpful. Current research attempts to describe strategies following the deployment of various technologies. The future role of technology in distance learning environments should be preceded by research efforts that define effective models and methodology.

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Appendix A

Diagram of Remote Classroom Facility

Figure A1. Diagram of remote classroom facility.

Appendix B

RELEASE FORM

This course is being observed for the purpose of studying the process involving videoconferencing technology in a higher education environment. All information collected will be considered confidential and will be used for the sole purpose of the study. Any personal information will be reported with anonymity to the individual. I grant permission for the use of this data to the researcher.

Course: ____________________ Date: _____________

Please sign below:

Instructor: __________________________

1. ______________________
2. ______________________
3. ______________________
4. ______________________
5. ______________________
6. ______________________
7. ______________________
8. ______________________
9. ______________________
10. ______________________
11. ______________________
12. ______________________
13. ______________________
14. ______________________
15. ______________________
16. ______________________
17. ______________________
18. ______________________
19. ______________________
20. ______________________
21. ______________________
22. ______________________
23. ______________________
24. ______________________

Figure B1. Release form for instructors and students.

Appendix C

Instructor

(Indirect)

(1) Accepts Feeling: Accepts and clarifies the students feelings in a non-threatening manner. Feelings may be positive or negative. Predicting or recalling feelings are included.

(2) Praises or Encourages: Praises or encourages student action or behavior, jokes that release tension, not at the expenses of another individual, nodding head or saying "um hm" or go on are included.

(Influence)

(3) Acceptance of Ideas of Student: Clarifying

(4) Asks Questions: Asking a question about content or procedure with the intent that a student answer.

(Direct)

(5) Lecturing. Giving facts or opinions about content or procedure.

(6) Giving Directions: Directions, commands, or orders to which a student is expected to comply.

(7) Criticizing or Justifying Authority: Statements intended to change student behavior from non-acceptance to acceptance pattern, bawling someone out, stating why the instructor is doing what he is doing; extreme self-reference.

Student

(1) Responsive Student Talk: Student response to instructor. Instructor initiates the contact or solicits student response.

(2) Initiative Talk of Student: Talk by students which they initiate. If "calling on" student is only to indicate who may talk next.

(3) Responsive Student Talk: Student response to another student.

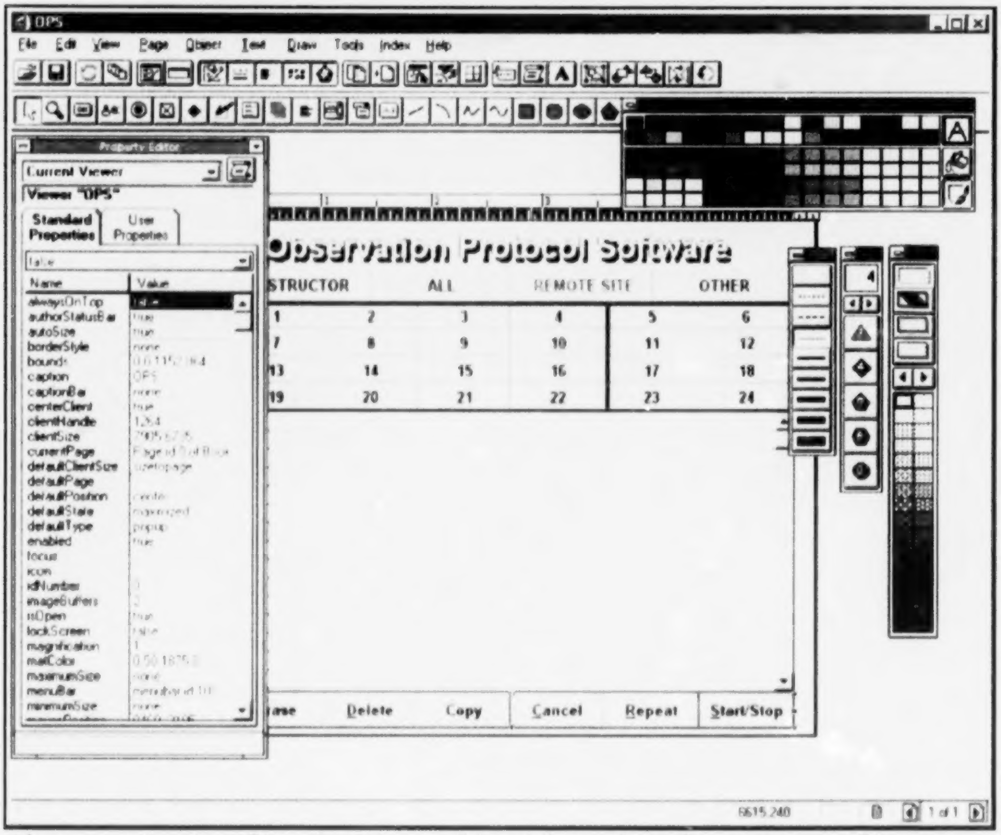
(4) Initiative Talk of Student: Talk by students which they initiate to another student.

Other

Silence or Confusion: Pauses, short periods of silence, and periods of confusion in which communication cannot be understood by the observer.

Figure C1. Flanders's Interaction Analysis Protocol

Appendix D
ToolBook II Application Development Software.


OPS
File Edit View Page Object Text Draw Tools Index Help
Property Editor
Current Viewer
Viewer "OPS"
Standard Properties
User Properties
Observation Protocol Software
STRUCTOR
ALL
REMOTE SITE
OTHER
1 2 3 4 5 6
7 8 9 10 11 12
13 14 15 16 17 18
19 20 21 22 23 24
ase
Delete
Copy
Cancel
Repeat
Start/Stop
6615 240
1 of 1

Name	Value
alwaysOnTop	false
authorStatusBar	true
autoSize	true
borderStyle	none
bounds	[illegible]
caption	OPS
captionBar	none
centerClient	true
clientHandle	1,264
clientSize	[illegible]
currentPage	[illegible]
defaultClientSize	sizetopage
defaultPage	
defaultPosition	center
defaultState	maximized
defaultType	popup
enabled	true
focus	
icon	
idNumber	0
imageBuffers	2
isOpen	true
lockScreen	false
magnification	1
mattColor	[illegible]
maximumSize	none
menuBar	[illegible]
minimumSize	none

Figure D1. ToolBook II application development software (Asymetrix Corporation, 1994). ToolBook II provides an editor for selecting objects to be used in an application. The user clicks and drags the object to the area of the screen where it is needed. Attributes are given the object to define how the object appears and behaves when selected.

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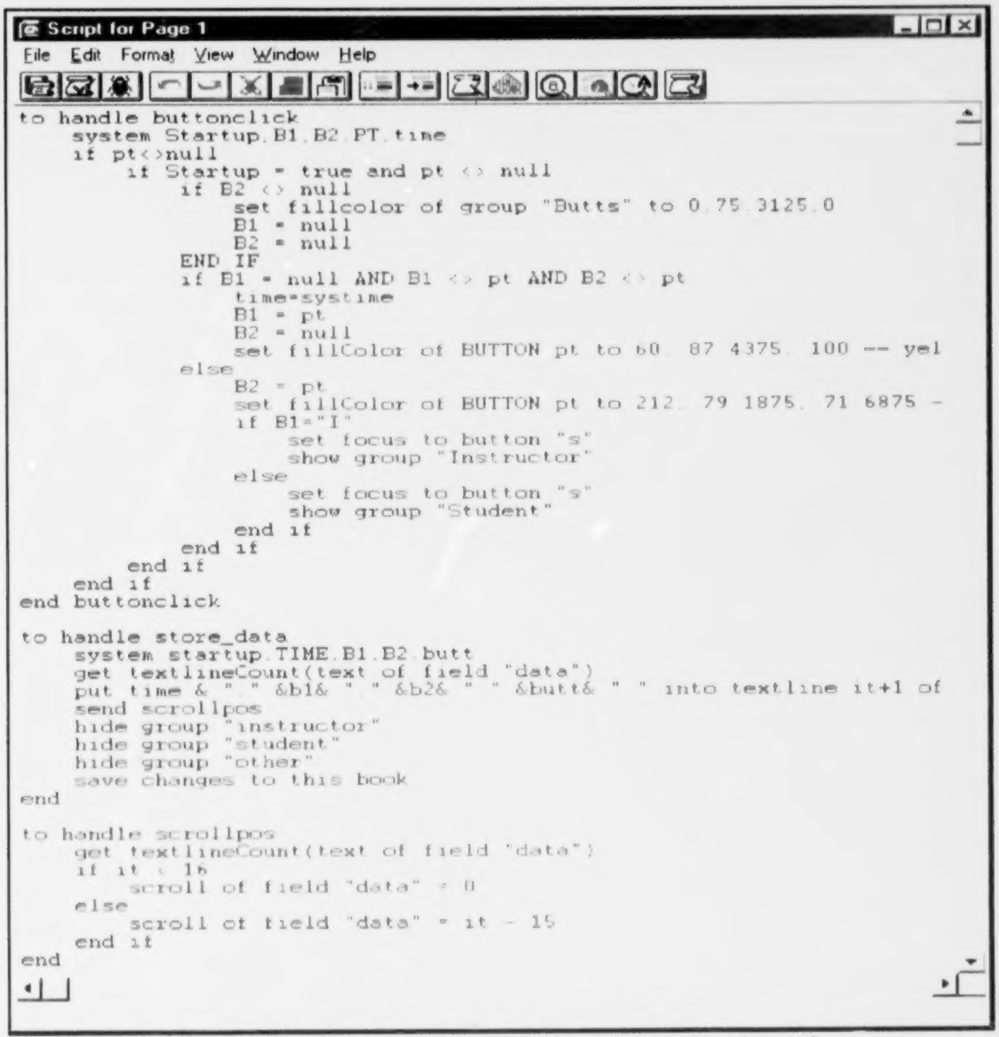


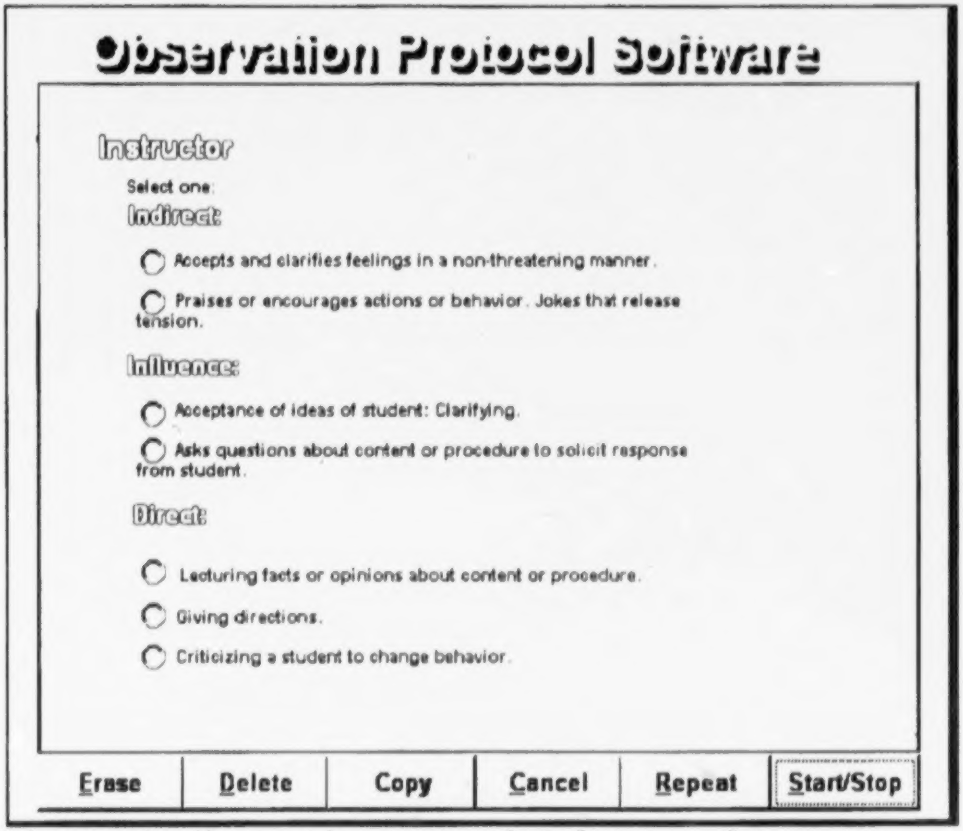
```
to handle buttonclick
    system Startup,B1,B2,PT,time
    if pt<>null
        if Startup = true and pt <> null
            if B2 <> null
                set fillcolor of group "Butts" to 0,75.3125,0
                B1 = null
                B2 = null
            END IF
            if B1 = null AND B1 <> pt AND B2 <> pt
                time=systime
                B1 = pt
                B2 = null
                set fillColor of BUTTON pt to 60, 87.4375, 100 -- yel
            else
                B2 = pt
                set fillColor of BUTTON pt to 212, 79.1875, 71.6875 -
                if B1="I"
                    set focus to button "s"
                    show group "Instructor"
                else
                    set focus to button "s"
                    show group "Student"
                end if
            end if
        end if
    end if
end buttonclick

to handle store_data
    system startup,TIME,B1,B2,butt
    get textlineCount(text of field "data")
    put time & "," &b1& "," &b2& "," &butt& "," into textline it+1 of
    send scrollpos
    hide group "instructor"
    hide group "student"
    hide group "other"
    save changes to this book
end

to handle scrollpos
    get textlineCount(text of field "data")
    if it < 16
        scroll of field "data" = 0
    else
        scroll of field "data" = it - 15
    end if
end
```

Figure D2. ToolBook II OpenScript programming language (Asymetrix Corporation, 1994). A script programming language allows the user to create complex event driven code to react to specific conditions and to send messages to other objects in the application. This is actual code for OPS that is stored with page one.

Appendix E
Observation Protocol Software Data Entry Screens



Observation Protocol Software

Instructor

Select one:

Indirect:

○ Accepts and clarifies feelings in a non-threatening manner.

○ Praises or encourages actions or behavior. Jokes that release tension.

Influence:

○ Acceptance of ideas of student: Clarifying.

○ Asks questions about content or procedure to solicit response from student.

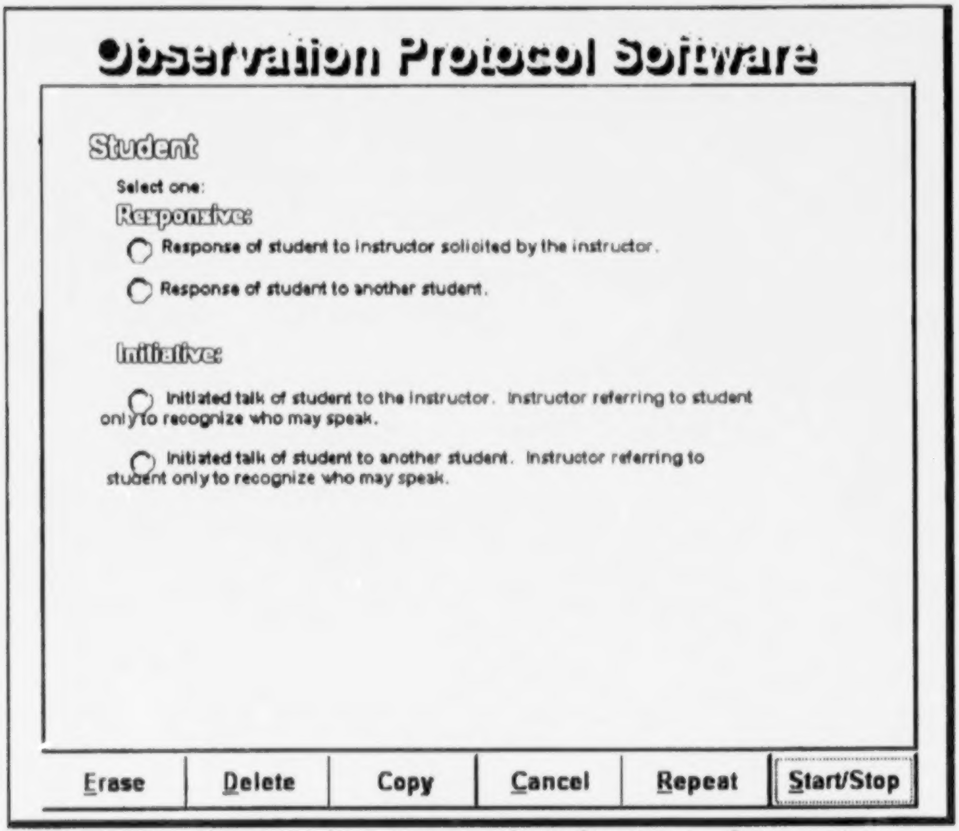
Direct:

○ Lecturing facts or opinions about content or procedure.

○ Giving directions.

○ Criticizing a student to change behavior.

Figure E1. Observation Protocol Software - data entry screen for the instructor events. Codes are entered by clicking on the button corresponding to the type of interaction. The display returns to the main screen for further data entry.



Observation Protocol Software

Student

Select one:

Responsive:

○ Response of student to instructor solicited by the instructor.

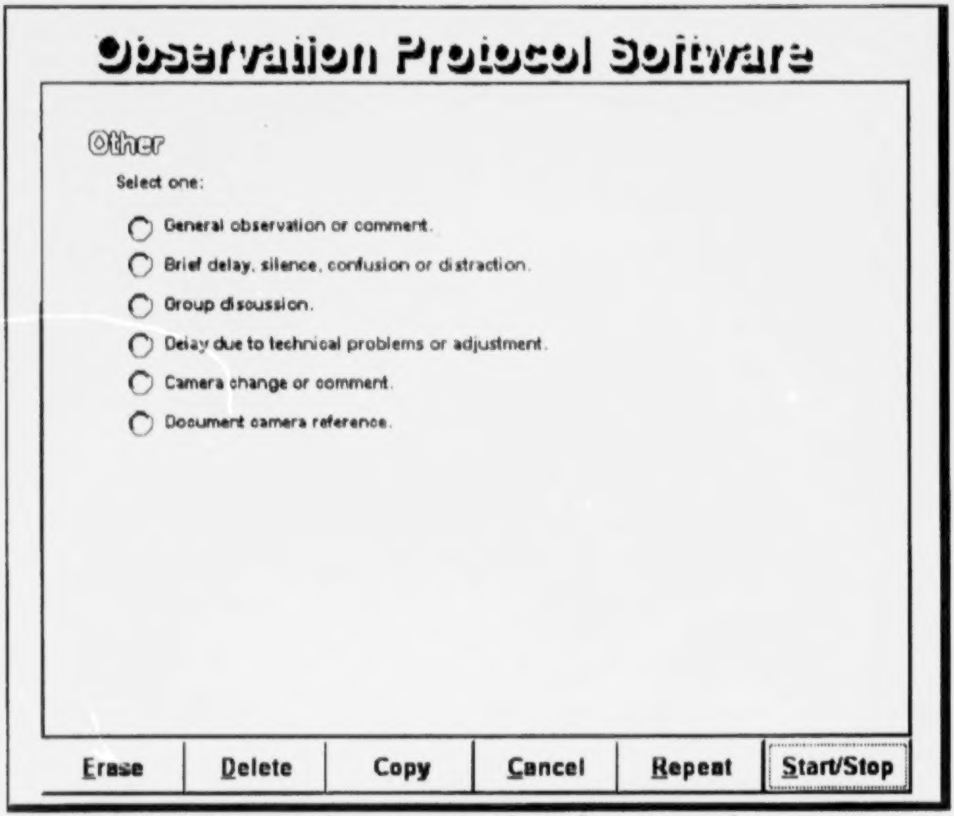
○ Response of student to another student.

Initiative:

○ Initiated talk of student to the instructor. Instructor referring to student only to recognize who may speak.

○ Initiated talk of student to another student. Instructor referring to student only to recognize who may speak.

Figure E2. Observation Protocol Software - data entry screen for student events. Codes are entered by clicking on the button corresponding to the type of interaction. The display returns to the main screen for further data entry.



Observation Protocol Software

Other

Select one:

- ○ General observation or comment.
- ○ Brief delay, silence, confusion or distraction.
- ○ Group discussion.
- ○ Delay due to technical problems or adjustment.
- ○ Camera change or comment.
- ○ Document camera reference.

Figure E3. Observation Protocol Software - data entry screen for other events including delays, camera events, and general comments. Codes are entered by clicking on the button corresponding to the type of interaction. The display returns to the main screen for further data entry.

Appendix F

Observation and Interview Data Structure

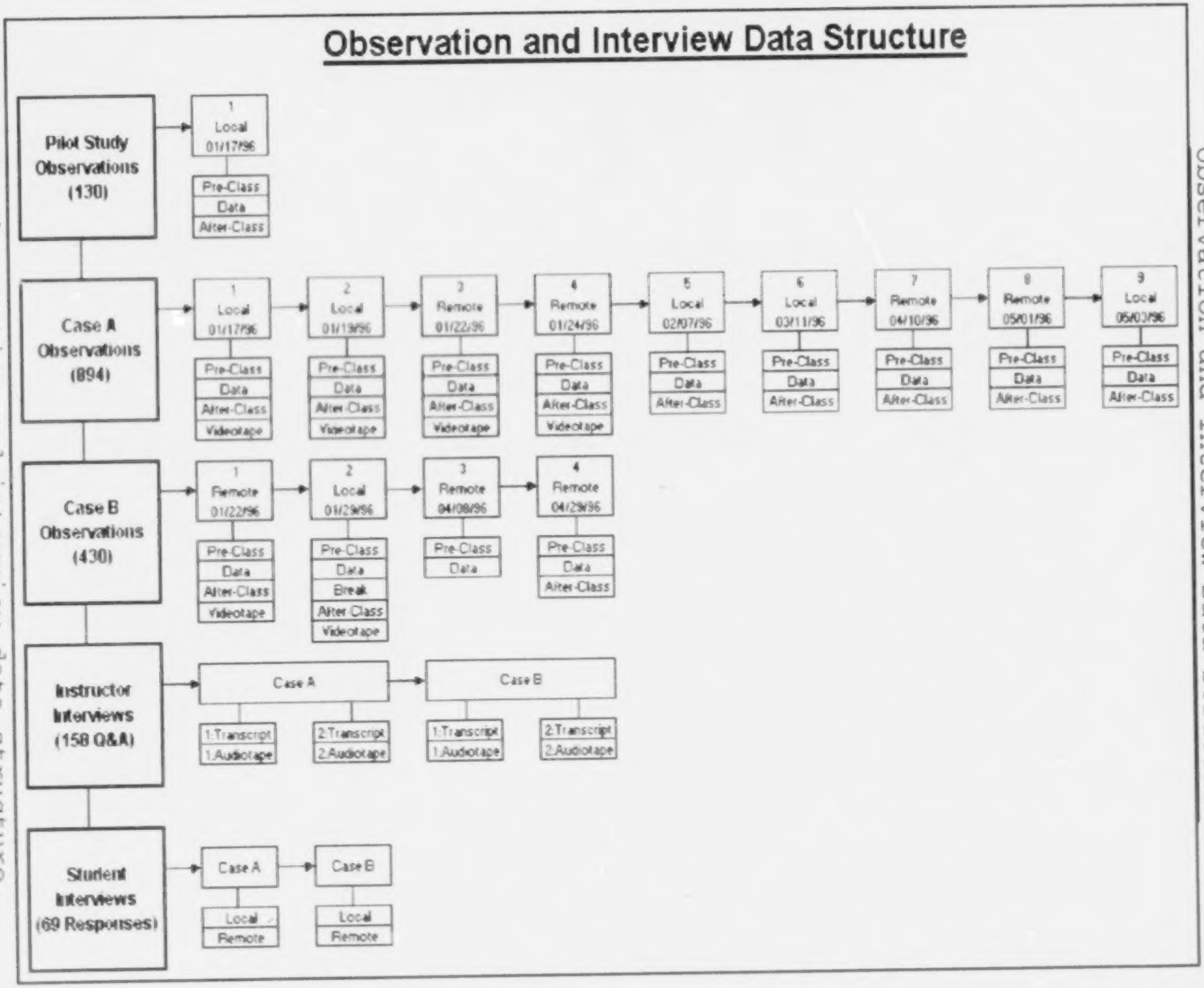

Observation and Interview Data Structure
Pilot Study Observations (130)
1 Local 01/17/96
Pre-Class
Data
After-Class
Case A Observations (894)
1 Local 01/17/96
2 Local 01/19/96
3 Remote 01/22/96
4 Remote 01/24/96
5 Local 02/07/96
6 Local 03/11/96
7 Remote 04/10/96
8 Remote 05/01/96
9 Local 05/03/96
Pre-Class
Data
After-Class
Videotape
Case B Observations (430)
1 Remote 01/22/96
2 Local 01/29/96
3 Remote 04/08/96
4 Remote 04/29/96
Pre-Class
Data
Break
After-Class
Videotape
Instructor Interviews (158 Q&A)
Case A
Case B
1:Transcript
1:Audiotape
2:Transcript
2:Audiotape
Student Interviews (69 Responses)
Case A
Case B
Local
Remote

Figure F1. Observation and interview data structure.

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Vita

The researcher was born in Stuttgart, Arkansas, in 1953. He grew up in Texarkana, Arkansas and graduated high school in 1971. After receiving his bachelor of Music Education degree in 1976 and master of Educational Technology degree in 1977, while attending the University of Central Arkansas in Conway, Arkansas, he began his career in Missouri as an educational technology specialist with the Fort Leonard Wood Public Schools. Soon afterwards, he moved to Baton Rouge, Louisiana, to accept a position at Louisiana State University with the Division of Instructional Support and Development where he managed the instructional television studio, photography lab and materials center. He later became a Computer Analyst with the Louisiana State University (L.S.U.) System Network Computer Center, where he developed the Microcomputer Information Support Center and created educational training materials for teaching WIDJET, TSO, and VM.

After developing partnerships with business and industry and providing campus-wide consulting, he became Program Director of a newly created computer training program within the Division of Continuing Education where he designed curricula, developed and implemented marketing strategies and administered and taught hundreds of courses including an award-winning distance learning training program to eight locations state-wide via satellite for the State Office of Nutrition. He developed customized curricula for training and certifying employees within the State Office of Community Services, Department of Transportation and the Department of Labor. In a technical support role for the university, he recommended, procured and maintained several computer environments including LANs, WANs, electronic messaging systems, database systems, mainframe access, publishing systems and interactive video/audio/graphic conferencing systems. Many of the programs included training seminars for faculty in computer applications, telecommunications, networking, and videoconferencing. He was involved in developing the videoconferencing systems that linked to other institutions as part of the Distance Learning initiative of Louisiana State University.

As the Director of the L.S.U. Computer Training, Mr. Atkinson developed a comprehensive state-wide training program which included 300 courses, 40 instructors, 3,500 participants per year with a annual budget of 1.2 million dollars in revenues. The program provided training for business and industry, five state agencies and the general public through seven computer networked labs. As an Assistant to the Dean, he developed departmental missions, goals, objectives, organizational plans, instructional models and methods to reach learning outcomes.

Before continuing his educational goals, Mr. Atkinson served as Assistant Director for Technology Planning and Development with the Louisiana Center for Educational Technology at the State Department of Education where he formulated and implemented detailed plans and programs for the operation of the center.

With the completion and approval of this document, the researcher plans to earn his doctorate in Educational Leadership and Research from the College of Education at Louisiana State University before the turn of the century.

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SUMMARY

At Central Missouri State University, the Educational Technology graduate level courses help teachers, technology coordinators, and school administrators develop skills, field experiences, leadership, and a foundation in research for applying instructional technologies in education. As an **Assistant Professor**, I've taught Educational Leadership, Instructional Design, Computing Systems, Distance Learning, Advanced Production in Web Design, and Product Development. I also serve as an adjunct professor in an Educational Leadership Doctoral Program at Missouri University in Columbia.

In my position as **Assistant Director** of Educational Technology for the State Department of Education, I established links throughout the state involving many forms of distance learning and networking within the K-12 environment. That opportunity provided tremendous insight into the capabilities, needs and challenges of the school systems across the state.

With 17 years at Louisiana State University (LSU) as both an administrator and provider of technical training in technology, I am very familiar with the role of education as it relates to technology. I served on the LSU Advisory Council for Distance Learning and the East Baton Rouge Parish Technology Committee. I helped coordinate and present at the Louisiana Computer Using Educators (LaCUE) Conference and the Tech-U Seminars sponsored by LaSIP, the LSU College of Education and the Southern University Department of Computer Science. I have frequently been called upon to serve as an advisor for public and private schools and institutions throughout Louisiana. My knowledge and experience focused on integrating technology into the school curricula, training of faculty and staff, creating links to business, industry and the community and developing guidelines and assessment models to verify the progress.

My career began in the public schools of Missouri as a Media Coordinator which soon led to a job at LSU with the Division of Instructional Support and Development (DISD) where I managed the instructional television studio, photography lab and materials center. Soon after leaving DISD, I became a **Computer Analyst** at the LSU System Network Computer Center, where I developed the Microcomputer Information Center and created educational training materials for teaching WIDJET, TSO, and VM. I developed partnerships with business and industry and provided campus-wide consulting. Soon, I was recruited by the Division of Continuing Education to direct a newly developed computer training program. As **Program Director** for more than 10 years, I designed curricula, developed and implemented marketing strategies and administered and taught hundreds of courses including an award winning program for computer training to 8 locations state-wide simultaneously via satellite for the State Office of Nutrition. Other customized curricula included courses to train and certify employees within the State Office of Community Services, Department of Transportation and the Department of Labor. I recommended, procured and maintained several computer environments including LANs, WANs, electronic messaging systems, database systems, mainframe access, publishing systems and interactive video/audio/graphic conferencing systems. Many of the programs included faculty training seminars in computer applications, telecommunications, networking and video conferencing. I developed the specifications for launching the LSU videoconferencing systems which linked to many other institutions as part of the Distance Learning initiative at LSU. I recently concluded a qualitative case study that focused on the interactive nature of the process in distance learning using compressed videoconferencing.

As the Director of LSU Computer Training, I developed departmental missions, goals, objectives, and organizational plans that led to a comprehensive, state-wide training program which included:

- *Over 300 courses with 3,500 enrollments / yr.*
- *40 instructors*
- *Budget of $1.2 million in revenues*
- *5 state agency and certification training programs*
- *7 computer networked training labs.*

I was later appointed as **Assistant to the Dean** of Continuing Education, to help articulate the use of technology within the Division. I understand the budgeting and fiscal policies and procedures within an institution and have worked with committees and advisory boards in designing and developing the infrastructure of an educational system. I directly supervised staff that provided customer service functions to assist participants attending the programs. As the **Assessment Coordinator** for the Division, I designed instructional models and methods to reach learning outcomes in compliance with SACS.

As a **business technology consultant**, I developed computer software to solve problems for both educational and business needs and advised several governmental agencies including the FBI, Department of Labor, Division of Administration, Department of Education, Office of Elderly Affairs, Office of Nutrition, Office of Community Services and the Governor's Office. I have developed software for training, process tracking, data collection, informational kiosks, LAN and WAN systems, ISDN and T1 telecommunication systems and web sites.
In the **community**, I served for 10 years as host of the "TecTalk" show on WJBO Talk Radio each week and contributed articles on technology to the "South Baton Rouge Journal". As a jazz educator/performer and active member of the Baton Rouge Concert Band, I have performed at schools, churches, and various functions. For more than 20 years, I have devoted most of my career to helping others succeed in technology and education.

EDUCATION

Louisiana State University, Baton Rouge, Louisiana
Major: Educational Leadership and Research, Ph.D., 1999
Minor: Computer Science and Information Science
Dissertation: A Study of Distance Learning through Videoconferencing

University of Central Arkansas, Conway, Arkansas
Bachelor of Music Education, Instrumental Music, 1976
Master of Educational Technology, 1977

EXPERIENCE

Present Assistant Professor, Instructional Technology
Central Missouri State University

The Department of Educational Leadership and Human Development offers a Masters Degree in Educational Technology and a minor in Instructional Media Technology. The program helps teachers, technology coordinators, and school administrators develop skills, field experiences, leadership, and a foundation in research for applying technology in education. Graduates master concepts and skills necessary for the use of technology in educational settings. They also gain field experience that combines teaching skills and concepts with knowledge of how to use computers and related technologies in ways that enhance their integration into classroom instruction. Educational technology students also gain leadership skills that can be used to assist teachers in designing lessons that use technology to meet the learning needs of their pupils.

Courses Taught:
- Educational Leadership
- Instructional Design
- Computing Systems
- Distance Learning
- Advanced Production
- Product Development

I was awarded three technology grants ($25,000) from the Center for Academic Technology at CMSU for enhancing the instructional technology program. As recipient of a $10,000 stipend for developing online courses, I am constructing web-based learning modules for Educational Leadership in Technology. Courses will incorporate video and audio streaming, original graphics and animations that provide interactive problem-based and situation learning. I was selected to serve as an evaluator for the PBS Adult Learning: Tech-Knowledge Series for online courses in technology. Still pending, I submitted a grant proposal ($900,000) to the U.S. Department of Education: Preparing Teachers for Tomorrow's Technology (PT3) to enhance training of pre-service teachers for using technology in the classroom.

CMSU sponsored 11 new charter schools in Kansas City during the fall of 1999. I participated on the review team that evaluated their performance. The results will be published in July, 2000.

1997-1998 Assistant Director for Technology Planning and Development,
Louisiana Center for Educational Technology (LCET), State Department of Education

The Assistant Director formulated and implemented detailed plans and programs for the operation of the LCET. These included professional development, teacher preparation and certification, electronic curricula and curricular materials, assessment, community partnerships and public awareness, access to the Internet, planning for technology integration, program evaluation and technical infrastructure. This position was highly professional, technical, and supervisory and was concerned with the analysis, translation and design of educational technology systems.

Specific Responsibilities include:

- The design and implementation of the LCET Technical Assistance Program for K-12 schools which supports statewide networking and Internet access,
- Establish educational technology infrastructure recommendations that address state, district and local school responsibilities, including policies concerning ethical, legal, and security issues as they pertain to the technical infrastructure,
- Prepare correspondence, reports and presentations to the Board of Elementary and Secondary Education, the legislature, the State Technology Advisory Committee, the State Educational Technology Planning Committee, the State Universal Access Committee (E-Rate), the Southern Regional Educational Board (SREB), La. Systemic Initiatives Program (LaSIP), La. Innovative Challenge Grant Program, Technology Consortium for Teacher Education (LaTCTE), La. Computer Using Educators Board and other regional and statewide professional groups,
- Coordinate and communicate between the Department of Education and Regional Centers and other state agencies and institutions including the Division of Administration, Department of Education, Regional Service Centers, Board of Regents, Governor's Office, Legislative Offices, Office of Telecommunications Office, Public School Districts and Non-public Schools Systems, FCC, Public Service Commission and universities,
- Facilitate the development and implementation of a statewide networking structure in collaboration with the broader education community, that supports high standards, student achievement, equity of access, and accountability,
- Meet regularly with other State Department of Education divisions to advise on policies and procedures,
- Assemble and facilitate a technical Standards Committee with representatives from school, district, state, and industry entities to develop and adopt uniform technical standards,
- Provide information on emerging hardware, software, networking,
- Coordinate with Information Services, Office of Telecommunications, and the Division of Administration to develop contracts, requests for proposals (RFP), infrastructure, and Internet activities to serve the schools and to ensure that all proposals include equitable access to technology and a sound technical structure,
- Assist schools in developing their technology plans and grant applications
- Identify and develop compressed video networking, video server applications, and teleconferencing capabilities within the State Department of Education and school districts.

1994-1997 Assistant Dean, LSU Division of Continuing Education

As Assistant to the Dean, my job involved many different administrative tasks. The following list includes the primary tasks to which I was assigned:

- Negotiated cable services for the Division,
- Arranged satellite downlinks for C Band and KU band,
- Negotiated a cable broadcast channel for educational programming of the Division,
- Created a Customer Service Center and Centralized Information Desk
- Designed and implemented a telecommunications auto-attend system
- Negotiated telephone and data access services for the Conference Center,
- Researched feasibility of compressed video conferencing for delivery of distance learning programs
- Created an informational multimedia kiosk featuring video and graphics components to highlight programs, personnel, schedules, maps, and course information,
- Designed and implemented the Division of Continuing Education primary web site
- Served as Distance Education Advisory Council member (also served on subcommittee for delivery systems to develop guidelines and recommendations for the deployment of instructional technology in distance learning environments)
- Served as Assessment Coordinator for the Division on Accreditation (included working with program coordinators to identify learning outcomes, methods of evaluation, and reporting systems
- Compiled and submitted assessment information on programs in the Division to meet the objectives required by accreditation agencies
- Served as technology advisor to the English Language Orientation Program (designed a compressed video server system for delivering interactive instructional programming on demand)
- Supervised Non-Credit Registration Office

1984-1994 Director of Computer Instruction & Support, LSU Division of Continuing Education

The Computer Resources Center (CRC) provides opportunities for non-traditional learners to access the highest level of instruction in their areas of interest, and to encourage increased participation in educational programs. The CRC programs serve as an outreach function for the academic departments of the University, providing a channel for faculty members to share their expertise beyond the traditional campus setting.

The Division offers a wide variety of non-credit and certificate programs in personal enrichment, academic, professional, and special interest areas to the general public. Programs are developed by professional program coordinators to meet a variety of standards, including quality of content and instruction, interest level and appeal to potential participants, needs of particular professional and business groups, and cost-effectiveness. Qualified instructors teach courses, seminars, conferences, and workshops, many of which are LSU faculty members. Programs are publicized on a local, statewide, national, and international level, depending on the target audience for the activity. The diversity of programs led to the development of several distinct program areas within the Division, which have different audiences, objectives and goals.
As Director of the Computer Training Programs, my primary responsibilities included the following:

Responsibilities:

I. **PLANNING**

Establish a philosophy, mission, goals and objectives for CRC; Forecast market, program, and personnel needs; Establish a long-range strategic plan for CRC; coordinate this plan with the mission, goals, objectives, and constraints of the Division of Continuing Education (DOCE); Plan program areas and specific courses, budgeting, physical facilities, and personnel required to achieve the goals, objectives, and long-range plans of the CRC;

II. **PERSONNEL**

Evaluate staffing needs and obtain approval for staff changes; Prepare detailed job descriptions for all existing and potential positions, including qualifications, responsibilities, and performance and appraisal standards; Select and hire additional staff as needed, train new and existing personnel, periodically appraise staff performance and reward or correct, as appropriate;

III. PROGRAMMING

Develop an atmosphere and spirit of alert creativity conducive to the conception and development of new programming ideas, collect and initiate such program ideas; Evaluate proposals with regard to assessed needs, marketability, appropriateness, profitability, duplication, and competition; Select appropriate programs; assign to staff for development and implementation;

Maintain an ongoing program to assess the quality, response, profitability, and appropriateness of existing programs; Adjust, re-schedule, reassign, or eliminate as required; provide feedback to planning process;

IV. MARKETING

Develop and maintain a continuous campaign to promote CRC within the LSU community as an asset to the goals and objectives of the University and its faculty & staff; Enhance the image of CRC and the DOCE in the local faculty & staff; Enhance the image of CRC and the DOCE in the local, regional, and professional communities through continuing public relations efforts;

Promote new and existing programs and courses to prospective participants through timely advertising, including self-published catalogs and brochures, direct mail campaigns, direct distribution, and full use of the public advertising media; Maximize the use of low-cost media, including published articles, activities listings, and PSA's in both print and broadcast media;

V. MANAGEMENT

Set a personal example of the desired attitude and standards of performance expected from CRC employees; Encourage an atmosphere of professionalism conducive to the achievement of the goals and standards of CRC and DOCE; Conduct meetings and presentations, and handle crisis situations in an effective, professional manner; Maintain and upgrade management skills and motivate staff to improve their job skills;

Continually review and evaluate the organization and systems of CRC, assess needs, allocate resources, schedule tasks and programs to provide optimum utilization of physical, informational, and human resources;

Supervise the allocation of staff workload, oversee assignment, scheduling, and management of employees, among the programs and support tasks; Provide direct supervision of all personnel, as needed, monitor performance for timeliness and quality standards; Counsel, coach, and motivate all personnel; Enforce University rules and regulations;
Evaluate existing policies and procedures, correct and expand as needed to provide a systematic, efficient system to control and monitor the workload and staff performance to ensure optimum utilization of resources; Insure that external policies regarding interaction with outside individuals and organizations are in compliance with University applicable regulations, goals, and objectives; Establish and monitor an effective program to maintain these systems; Conduct both informal and periodic formal reviews of the effectiveness of management policies and performance in attaining the plans, goals, and objectives of CRC, adjust as necessary to correct perceived deficiencies;

VI. FISCAL

Monitor the financial condition and performance of CRC through evaluation of budget proposals, budget, and financial statements and summaries generated by CRC & DOCE systems; Provide feedback to facilitate management and planning by reporting trends and summaries, as appropriate, to subordinates, peers, and higher management; Adjust activities and policies as needed to reflect the changing fiscal situation;

Insure the preservation and effective use of University assets available to CRC, including those provided by general funds, grants, contracts, and self-generated revenues; Monitor systems provided for the accounting and control of assets;

VII. PHYSICAL RESOURCES

Evaluate use of existing physical facilities and equipment, take steps to optimize utilization and sharing of resources; Request purchase of equipment necessary for achieving goals and objectives; Implement procedures for accountability and security of all facilities and equipment;

Establish, maintain, review, and revise as necessary all systems in place or appropriate for effective conduct of the business of CRC; Included in the area are general office systems, computer systems, and record systems. Provide a program of timely and effective systems maintenance;

VIII. INSTRUCTION

For more than ten years, taught university courses in DOS, Windows, Word Processing, Spreadsheets, Networking, and Multimedia.

Summary of Responsibilities:

- Design curricula
- Define course guidelines, objectives, and content
- Coordinate and schedule courses and related activities
- Procure, prepare, and maintain software and hardware for 7 computer labs (IBM, Macintosh,AS400)
- Advise and counsel course participants
- Develop and implement marketing strategies
- Provide course instruction
- Hire, supervise, and train course instructors
- Administer the computer certification program
- Develop markets within government agencies, corporate & industrial, and other universities
- Develop automated computerized registration system
- Acquired educational grants from IBM, Apple, Zenith, and Novell

1983-1984 Computer Analyst, LSU System Network Computer Center

- Provided campus-wide computer consulting
- Developed & maintained LSU microcomputer information database/bulletin board
- Assisted in operation of Microcomputer Information Center
- Supervised and assisted operation of IBM & Apple Technical Support Centers at LSU
- Developed media presentations
- Assisted in production of newsletter & various computer center publications
- Advised & assisted faculty and staff in purchasing and implementing computer related equipment
- Advised, installed & maintained network labs (College of Engineering, College of Business, Continuing
- Education, Experimental Statistics)
- Instructed faculty & staff in computer literacy, communications, networking, & programming
- Installed & maintained protocol converter equipment to provide communication between microcomputer
- labs and mainframe facilities between the Center & departments

1981-1983 CEO, Global Electronics, Inc., Baton Rouge, La.

- Retailed satellite receivers and video/audio component systems
- Provided electronic parts & service
- Managed business accounting, inventory, personnel

1978-1980 Supervisor, LSU Instructional Resources Center

- Supervised remote and studio instructional television productions
- Developed and conducted workshops, orientation, and training sessions for faculty, students, and visitors
- Established and supervised a photographic production service including color slides, prints, developing, and duplication
- Produced slide/tape and multi-image programs

- Established and supervised a materials graphics center
- Produced educational media materials and graphics
- Established and supervised an audio duplication service
- Supervised an equipment inventory and distribution service
- Assisted faculty in instructional design, development and implementation of educational programs

1977-1978 Media Coordinator, Waynesville, MO, Public School District

- Supervised & maintained inventory and catalog of hardware and software
- Established policies and procedures for the Media Center
- Produced instructional programs
- Conducted workshops and training sessions to develop faculty awareness and methods of presentation and instruction

1975-1977 Graduate Assistant, University of Central Arkansas, AR

- Supervised & maintained television production studio
- Managed film library and materials center
- Managed photographic lab
- Provided AV support and distribution

ACTIVITIES

Organizations:

National University Continuing Education Association (NUCEA)
National University Telecommunications Network (NUTN)
Louisiana Association for Educational Communications and Technology (LAECT)
Arkansas Audio-Visual Association (AAVA)
Association for Educational Communications and Technology (AECT)
Kiwanis Club of Pulaski County, Missouri (Past President)
Missouri Association for Educational Communications and Technology (MAECT)

Software Developments:

Reading Enhancement and Development (accompanies a textbook with over 40,000 in circulation)
College Learning and Study Skills (accompanies a textbook with over 15,000 in circulation)
Government Services Institute (Client Database System)
Pelican Management Billing System (Corporate Billing Database System)
Governor's Office of Elderly Affairs (Client Database/Monitoring System)
La. State Department of Education (Spreadsheet Budgeting System)
Scientific Systems (Automated Process Tracking System)
DOA, Office of Facility, Planning and Control (Data Collection System)
Lod Cooke LSU Alumni Center, "Tiger Walk" Kiosk
LSU Division of Continuing Education, Informational Kiosk
LSU Division of Continuing Education Web Site
LSU Lab School Web Site: Outback - 5th grade
La. State Land Office (database)

Media Productions: (multi-image/audio/video)

Historical Review of the Supreme Court Justices
LSU PASS Program
Introduction to Junior Division
WIDJET video training film (Part I & II)
Intro. to the System Network Computer Center
"TecTalk" Radio Talk Show, WJBO

Publications:

Case Study of Interactions Using Videoconferencing Systems (AERA)
Kansas City Charter Schools (CMSU)

REFERENCES

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